580.5
FB
v.20:5-7
v.22:6-10
1942
cop.2

SHOUT
SHARE

0.5
8
22 10
op.3

HAWAIIAN PITTOSPORA

SOME MEXICAN COREOPSIDEAE

A NOTE ON XYLOSMA HAWAIIENSE SEEM.

BY

EARL EDWARD SHERFF

RESEARCH ASSOCIATE, SYSTEMATIC BOTANY

BOTANICAL SERIES
FIELD MUSEUM OF NATURAL HISTORY
VOLUME 22, NUMBER 10
NOVEMBER 16, 1942

PUBLICATION 521

HAWAIIAN PITTOSPORA

SOME MEXICAN COREOPSIDEAE

A NOTE ON XYLOSMA HAWAIIENSE SEEM.

BY

EARL EDWARD SHERFF

RESEARCH ASSOCIATE, SYSTEMATIC BOTANY

THE LIBRARY OF THE

MAR 13 1944

UNIVERSITY OF ILLINOIS

BOTANICAL SERIES

FIELD MUSEUM OF NATURAL HISTORY

VOLUME 22, NUMBER 10

NOVEMBER 16, 1942

PUBLICATION 521

PRINTED IN THE UNITED STATES OF AMERICA
BY FIELD MUSEUM PRESS

80.5
FB
v.22[10]
op.3

REVISION OF THE HAWAIIAN MEMBERS OF THE GENUS PITTOSPORUM BANKS[1]

EARL EDWARD SHERFF

INTRODUCTION AND HISTORICAL NOTES

The bibliography of the genus *Pittosporum* Banks may properly begin with Joseph Gaertner's De Fructibus et Seminibus Plantarum 1: 286. 1788. In that work Gaertner published a four-line generic description which he had found in Dr. Solander's papers, and described in detail two new species, *P. tenuifolium* and *P. umbellatum*. The former he illustrated as to fruits and seeds (*tab.* 59, *fig.* 7). From time to time other new species were described until, in 1862, Bentham & Hooker (Gen. Pl. 1: 131) were able to state the total number known as about 50 ("species ad 50, in Africa, Asia calidiore, insulis Pacificis, Australia v. Novae Zelandia crescentes"). Bentham & Hooker presented an amplified description and this apparently has served as a model for most if not all subsequent students of the genus.

Nearly all these earlier known species were from elsewhere than the Hawaiian Islands and so may be omitted here. We may note, however, that, in 1832, Hooker & Arnott (Bot. Beechey's Voy. 110) described the first endemic Hawaiian species, *P. glabrum*. Some time later Asa Gray, in his Botany of the United States Exploring Expedition (1: 232. 1854), included nineteen species of *Pittosporum* and among these were two additional Hawaiian species: *P. Terminalioides* Planchon, with one or doubtfully two varieties, and *P. confertiflorum* A. Gray. The latter he illustrated (*tab.* 19). Young Horace Mann, Jr., visited the Hawaiian Islands May 4th, 1864, and botanized extensively (with William T. Brigham) upon five members of the archipelago until May 18th of the following year. He collected many specimens of the genus and published three supposedly new species (Enum. Haw. Pl. nos. 18, 20, and 22; Proc. Amer. Acad. 7: 150–152. 1867): *P. cauliflorum*, *P. spathulatum*, and *P. acuminatum*. Of these the first and third are accepted as good species, and even the second is valid as a variety of *P. glabrum*.

[1] Native Hawaiian name for this genus, *Hoawa* (*fide* Hillebrand Fl. Haw. Isls. 22. 1888).

The first really comprehensive treatment of *Pittosporum* in the Hawaiian Islands was given, as for so many other genera, by William Hillebrand (Fl. Haw. Isls. 21–27. 1888). Hillebrand described four supposedly new species: *P. glomeratum, P. kauaiense, P. insigne,* and *P. hawaiiense.* He introduced eight new varieties among the various species and gave an analytical key to the ten species treated in his text. All but the first one of his four new species are accepted in the following pages, and even the first, *P. glomeratum,* is retained, but with varietal rank under *P. glabrum.* Hillebrand's key is of the dichotomous type and partly artificial. It makes no attempt to include individual varieties but does attempt to guide one directly to the proper species. Like many of Hillebrand's keys, it is now hopelessly out of date and has value chiefly as affording to the monographer or other advanced student an insight into Hillebrand's species-concepts. Hillebrand had resided in Honolulu for twenty years and had made most vigorous and brilliant studies of the Hawaiian plants. Withdrawing to Europe in 1871, he spent much additional time studying the Hawaiian Flora with the aid of library and herbarium materials, almost up to his death in 1886. Many of his Hawaiian collections had been sent previously to 1870 to Dr. Hooker at Kew or to Dr. Gray at Harvard University and are still well preserved. To these I have had access for the present revisional study. Hillebrand's large private herbarium, however, was finally deposited at the Botanical Museum in Berlin. Because of the present war-conditions, the *Pittosporum* specimens of this private herbarium are now inaccessible for examination, but the authorities of the Berlin Botanical Museum (at the Berlin Botanical Garden) have generously supplied photographs of the more important specimens not duplicated in the Gray or Kew herbaria.

In 1910, Joseph F. Rock (Bull. Torrey Bot. Club 37: 297, fig. 1; also Rept. Haw. Board Agr. and For. Div. For. 84, pl. 20. 1911) added another species to the Hawaiian *Pittospora, P. Hosmeri,* a species with mammoth capsules, these up to 7.5 cm. long and to 5.5 cm. wide. In 1911 (College Haw. Publ. Bull. 1: 16, pl. 4) he added still another species, *P. halophilum* (erroneously printed *P. halophylum, loc. cit.*). Shortly afterwards he presented a revised treatment of the arborescent Hawaiian species (Indig. Trees Haw. Isls. 153–172, pls. 55–64. 1913). In this he advanced still a third new species, *P. Gayanum,* also its new var. *waialealae* and the new var. *longifolium* of his *P. Hosmeri.* He gave detailed descriptions and many critical notes, also a key to the species. This key was

essentially the earlier one of Hillebrand's, modified slightly to cover the acquisitions since Hillebrand's time.

More recently, E. Pritzel has treated the entire family, Pittosporaceae, for Engler & Prantl's Natürliche Pflanzenfamilien (edit. 2. 18*a*: 265–286. 1930) and has given an especially comprehensive treatment of the genus *Pittosporum* (pp. 273–281, figs. 156 and 157). To his extended bibliography the reader is referred for numerous references that must be omitted here. Pritzel declares that since it is impossible to make a satisfactory arrangement or classification for the genus, he must rely upon the geographic distribution of its species. He states that a systematization of the genus must needs be based on the fruit before everything else, and this with many species is not yet sufficiently well known.[1] He separates the many species of the genus perforce into various great geographic groups, one of them the group endemic in the Hawaiian Islands. He adopts Rock's key *in toto*, merely translating it into the German. He apparently has overlooked *P. halophilum* Rock, the small shrub which Rock himself doubtless had omitted intentionally from his Indigenous Trees of the Hawaiian Islands because it was not really a tree. As it is, he lists the same twelve species treated by Rock.

More recently, Carl Skottsberg (Meddel. Göteborgs Botan. Trädgård 10: 108–110. 1936) has published determinations of various Hawaiian specimens and proposed three new varietal names: *P. Terminalioides* var. *macropus* and *P. cauliflorum* vars. *reticulatum* and *macrophyllum*. The last two are treated in the present text respectively as *P. cladanthum* var. *reticulatum* and *P. cladanthum*. One specimen cited by him (his no. 791) for *P. confertiflorum* A. Gray is listed under *P. Terminalioides* var. *mauiense* of the following treatment.

In recent years an introduced species, *P. undulatum* Vent., has become well established in the Kohala District of the Island of Hawaii. It has been rather fully treated by Otto Degener (Fl. Haw. fam. 156, May 5, 1937).

As an outgrowth of my own examination and revisional study of all available Hawaiian specimens of *Pittosporum*, a considerable number of additional species, varieties, and forms have come to

[1] These observations by Pritzel are so especially appropriate for the Hawaiian species of *Pittosporum* that they are reproduced here verbatim: "Da eine befriedigende natürliche Gliederung der Gattung noch nicht gegeben werden kann, so bleibt nichts anderes übrig, als sie nach ihrer Verbreitung zu behandeln. Ein künftiges System der Gattung wird sich vor allem auf die Frucht zu gründen haben, und diese ist bei vielen Arten noch nicht genügend bekannt."

light. These have been published in two recent papers (Amer. Journ. Bot. 28: 18–31. 1941; Field Mus. Bot. Ser. 22: 407–441. 1941). The present paper represents an attempt to consolidate the information contained in these other two papers with the main body of factual material in Hillebrand's Flora and elsewhere, and thus to afford as nearly serviceable a revisional or monographic treatment of the native and naturalized *Pittospora* of the Hawaiian Islands as the present state of our knowledge will permit.

As an almost absolutely necessary preliminary step to a comprehension of the Hawaiian species of *Pittosporum*, the student should ponder the remarks of Hillebrand, who had, during his long residence in the Hawaiian Islands, an excellent opportunity to collect and observe the specimens first-hand. These are so important that the liberty is taken of reproducing them herewith: "The Hawaiian species have bivalvular capsules,[1] distinct sepals, and the petals slightly cohering beyond their middle, while their blades are reflexed or expanded in salver-shape. The flowers in all of them are dimorphous, that is, they are of two kinds: *fertile* or *pistillate* (with a fully developed round ovary, easily distinguishable from the style, which equals or exceeds the tube of the corolla and bears a capitate 2-lobed stigma, while the stamens are only about half the length of the tube, and their slender barren sagittate anthers converge around the ovary) and *sterile* or *staminate* (the corolla is generally larger, the slender ovary passes gradually into the style, which, although of the same length as in the fertile flowers, ends in a truncate or bidentate stigma, while the stamens are as long as the tube of the corolla, or even longer, and bear full-sized oblong anthers). With this dimorphism would seem to run parallel a diclinism in some species, inasmuch as individual trees are found with only fertile or sterile flowers. In species where both sexes are combined on one plant the sterile inflorescences mostly occupy the apex or upper leaf-whorls, and the fertile ones the lower whorls or the bare branch; but there are species in which flowers of both sexes appear intermixed and without an appreciable difference in the size of the corollas. Furthermore, it may fairly be assumed that in a set of so closely related species the fertilization of which depends altogether on the concurrence of insects, hybrids will not be wanting. From all these circumstances results a complexity of characters which renders the exact limitation of each species very difficult, and it is to be hoped that

[1] Not always. For mention of 3- or even 4-valved capsules see footnote under *Pittosporum Terminalioides* var. *macropus*, p. 518.

a closer attention to them by future collectors will result in a more satisfactory arrangement of a genus of plants which until now has shown itself very refractory in the hands of systematists.

"A good principle of distribution [*sic*] may possibly be afforded by the capsules, which are either ovoid or subquadrangular and deeply wrinkled or furrowed, or compressed and smooth; but, as the mature fruits of many forms are not known yet, division can, for the present, not be based upon them. It happens, however, that the characters relied upon [in the synoptical key] . . . although apparently irrelevant, coincide to some extent with those afforded by the capsules and also with the color of the flowers."

In addition, some of the remarks about *Pittosporum* species by J. F. Rock (*op. cit.*), who collected for many years in the Hawaiian Islands and made special studies of the ligneous species, may well be introduced here: ". . . in the Hawaiian Islands, where they have reached a wonderful development. The species are dependent on the insects for pollination. The flowers of the Hawaiian species are dimorphous; that is, they are of two kinds—fertile and sterile. It is very difficult to render the exact limitation of each species, which is shown by the fact that the writer has found capsules belonging to three different species on a single inflorescence, on a tree found on the island of Lanai [p. 153] . . . . It is exceedingly difficult properly to diagnose the Hawaiian species of Pittosporum and more so the varieties [p. 161] . . . the species *confertiflorum* evidently being very variable, as there are as many different forms as there are Pittosporum trees and one would be naming individual trees. It is indeed puzzling, the question of specific distinction in the Hawaiian Pittosporums, thanks to the insects on which the plants depend for pollination [172]."

From these remarks of Hillebrand and of Rock it is evident that any revisional treatment of the *Pittospora* of the Hawaiian Islands must for many years to come, and until a vast amount of additional field-observations and perhaps also experimental studies can be made, be open to various criticisms. The question, for example, of possible hybridity in the case of any or most novelties recently placed on record is a troublesome one. Obviously, most newly found entities could be assumed by pure hypothesis to have been derived through hybridization of one form with another in the past and thus numerous assumed hybrids could be listed. But a similar course could perhaps as well be followed in many other genera. In such case we should have, it is feared, not an orderly, systematic

arrangement or schematic exposition of taxonomic entities that could henceforth be utilized easily or conveniently by students of the Hawaiian flora, but rather an unwieldy assemblage of guesswork products, most of them so manifestly hypothetical as to discourage their use. I have chosen the alternative course of treating each taxonomic entity, therefore, and until such time as evidence is adduced to the contrary, as being assumedly pure and entitled *per se* to occupy a definite category of *specific* or subordinate rank. It has been felt, moreover, that this procedure will have paved the way for a more successful attack in the future upon hybridity-problems by students who may care to study them. Incidentally, it may be observed here that students of the genus in the Hawaiian Islands must be prepared to evaluate the significance of any one diagnostic criterion quite differently in different species. Thus, for example, in certain species such as *P. glabrum* and *P. sulcatum*, the respectively smooth (*i.e.*, erugose) or much wrinkled or roughened (rugose) capsule constitutes a fairly reliable character, whereas in such a species as *P. flocculosum* (assuming of course that this is a pure species) it is utterly untrustworthy. So, too, with the matter of having some of the inflorescence terminal. With *P. confertiflorum*, for example, this appears a good character, while with *P. glabrum* it is so capricious as to have little taxonomic value. It is much to be hoped that collectors in the Hawaiian Islands will henceforth pay special attention to *Pittosporum* species in the field and obtain for herbaria large quantities of representative specimens. Especially is it urged that these be accompanied with the fullest notes as to ecological nature of the habitat, fruticose *versus* arborescent habit, color and presence or absence of odor in the fresh flowers, presence or absence of some *truly terminal* inflorescences on the branches, etc. In this way it should be possible for the future monographer to effect no little improvement in the admittedly preliminary and in some respects unsatisfactory treatment herewith set forth.

Much of the trouble in making a workable key for Hawaiian *Pittospora* lies in the fact that numerous subspecific entities, namely varieties and forms (*formae*), occur. While these have their individual criteria by which they usually can be recognized, they nevertheless afford so many intermediate characters as to make their respective species seem to intergrade or even overlap. For this reason, a key like Hillebrand's or Rock's, based entirely on morphological characters and purporting to lead at once to the proper species for the entire group of the Hawaiian Islands, can be of

little value. Perhaps as often as not it will lead to the wrong species. To obviate this difficulty I have first divided all species, varieties, and forms into geographic groups, one for each of the larger Hawaiian Islands (doing from sheer necessity what Pritzel, *loc. cit.*, did for the major geographic units of the world). I have then treated each species, variety, and form as a separate entity and, wherever feasible, have set it off separately in the key. Concomitantly with this procedure, each textual description has been drawn (as in all my other monographic works to the present date) to exclude subordinate taxonomic entities.[1] It is my sincere conviction that only in this way can most revisional treatments, in the present state of our knowledge and in cases where the groups studied are large and contain numerous subspecific categories or units, conduce to the proper degree of precision in taxonomic concept.

As in the case of my previous revisional studies, many photographs of the more important herbarium specimens have been taken. As formerly, a complete set has been retained for my own private collection and a duplicate set deposited in the Herbarium of Field Museum of Natural History.

To the authorities of Field Museum of Natural History, who have afforded the fullest opportunities for conducting the research summarized in the following pages, also to the authorities of all other co-operating institutions and to the several individual botanists that have lent their generous assistance, it is a pleasure to express here my appreciation and thanks.

Genus **PITTOSPORUM** Banks: Description

Banks *ex* Gaertner, Fruct. Sem. Pl. 1: 286, *tab.* 59, *fig.* 7. 1788.[2]

Shrubs or small trees, with us evergreen, the leaves often crowded in false whorls (two successive such whorls separated by a false internode which in reality is several consecutive true internodes combined, their intervening true nodes marked at least in youth by much reduced now bracteiform leaves), in our species entire (undulate-margined in the naturalized *P. undulatum*) and usually

[1] Thus, for example, *Pittosporum Terminalioides* has been described with peduncles up to 2.5 cm. long and capsular valves up to 2.8 cm. long. Its variety *macropus* has been described with peduncles up to 6 cm. long and its var. *macrocarpum* with capsules up to 4 cm. long.

[2] No attempt is made here to include the various synonyms for the name *Pittosporum* found in literature. These have been summarized by E. Pritzel *in* Engler & Prantl, Nat. Pflanzenfam. edit. 2. 18*a:* 273. 1930.

more or less revolute. Flowers in terminal or axillary racemes, panicles or subumbellate clusters. Sepals 5, distinct or at base united. Petals 5, their claws usually erect and often somewhat united to above the middle. Filaments subulate; anthers erect and ovate-oblong, their 2 linear-oblong cells opening by a lengthwise slit. Ovary sessile or shortly stipitate, with 2 or rarely 3–5 parietal placentas or as many cells with 8 or more ovules to each; style always well developed; stigma faintly lobed. Capsule often compressed dorsally to the leathery or finally woody valves; these thick and armed at apex with the persistent stylar base, inwardly bearing placentas lengthwise along their middle, in age often separating and flattening out. Seeds large (±7 mm. long), angular, smooth, exalate, black, with hard testa, embedded in a resinous, viscid pulp (whence the generic name: πιττα, pitch, +σπορος, seed).—A large genus of about 200 known species, widely distributed in the tropical and subtropical parts of the Eastern Hemisphere, from west Africa eastward to various islands of the Pacific Ocean. In the Hawaiian Islands, one species (*P. undulatum*) naturalized, the rest endemic.

CONSPECTUS OF SPECIES, VARIETIES, AND FORMS

PAGE

1. *Pittosporum acuminatum* 481
   var. β *leptopodum* 485
   var. γ *Degeneri* 485
   var. δ *magnifolium* 486
   var. ε *waimeanum* 486
2. *Pittosporum Helleri* 486
3. *Pittosporum glabrum* 487
   var. β *spathulatum* 494
      f. 1. *subcandidum* 496
      f. 2. *hypoleium* 496
   var. γ *intermedium* 497
   var. δ *glomeratum* 497
   var. ε *Tinifolium* 498
4. *Pittosporum acutisepalum* 499
5. *Pittosporum amplectens* 501
6. *Pittosporum sulcatum* 502
   var. β *Remyi* 507
   var. γ *Rumicifolium* 510
      f. 1. *tomentellum* 510

7. *Pittosporum dolosum* 511
var. β *aquilonium* 512
8. *Pittosporum Forbesii* 513
9. *Pittosporum Terminalioides* 514
var. β *macrocarpum* 517
var. γ *macropus* 517
var. δ *mauiense* 518
var. ε *lanaiense* 518
10. *Pittosporum kahananum* 519
11. *Pittosporum cauliflorum* 520
var. β *pedicellatum* 521
var. γ *cladanthoides* 523
12. *Pittosporum halophilum* 523
13. *Pittosporum cladanthum* 525
var. β *gracilipes* 529
var. γ *reticulatum* 530
14. *Pittosporum Gayanum* 531
var. β *waialealae* 533
15. *Pittosporum flocculosum* 533
16. *Pittosporum argentifolium* 535
var. β *Rockii* 536
var. γ *sessile* 537
17. *Pittosporum kauaiense* 538
var. β *phaeocarpum* 540
var. γ *repens* 541
18. *Pittosporum napaliense* 542
19. *Pittosporum insigne* 543
var. β *Lydgatei* 546
var. γ *micranthum* 548
var. δ *Hillebrandii* 548
var. ε *Fosbergii* 549
f. 1. *pertinax* 550
var. ζ *pelekunuanum* 551
20. *Pittosporum undulatum* 552
21. *Pittosporum confertiflorum* 553
var. β *Mannii* 554

var. γ *longipes* 558
var. δ *microphyllum* 559

22. *Pittosporum halophiloides* 559

23. *Pittosporum Hosmeri* 560
var. β *longifolium* 562
var. γ *Saint-Johnii* 564

24. *Pittosporum hawaiiense* 564

KEY

I. Natives of Hawaii

a. Capsules large, commonly 3–7.5 cm. long and 2–5.5 cm. wide or thick.

b. Capsules finally more or less glabrate.

23. *P. Hosmeri* and var. γ *Saint-Johnii.*

b. Capsules remaining more or less tomentose.

c. Leaf-blades mostly 1.5–3 cm. long; capsules globose or in outline broadly oblong, 2.8–5 cm. thick or wide.

23. *P. Hosmeri* var. β *longifolium.*

c. Leaf-blades mostly 5–12 cm. long; capsules ovate or more narrowly oblong in outline, under 2.9 cm. wide.

9. *P. Terminalioides* var. β *macrocarpum.*

a. Capsules smaller.

b. Capsules erugose; natives of northwestern Hawaii.

c. Leaf-blades up to 1.3 dm. long and to 3.3 cm. wide, their margins undulate and their lower surfaces not conspicuously salient-veiny; capsules in terminal clusters, their valves mostly ±1 cm. long excluding the stylar beak.

20. *P. undulatum.*

c. Leaf-blades up to 1.9 dm. long and to 6.5 or even 8 cm. wide, their margins not undulate, their lower surfaces conspicuously salient-veiny; capsules in axillary or cauline clusters, their valves ±2.3 cm. long excluding the stylar beak. . . . . 5. *P. amplectens.*

b. Capsules more or less rugose.

c. Capsules finally more or less glabrate. . . . . 24. *P. hawaiiense.*

c. Capsules remaining mostly pubescent.

d. Leaves finally more or less glabrate beneath.

9. *P. Terminalioides.*

d. Leaves mostly remaining tomentose beneath.

e. Leaves mostly pale brownish- or whitish-tomentose beneath; sepals broadly ovate.

21. *P. confertiflorum* sensu stricto.

e. Leaves mostly rufo-tomentose at least into or through submaturity.

f. Inflorescences mostly terminal, lateral ones if present having peduncles mostly under 2 cm. long.

21. *P. confertiflorum* var. *β Mannii.*

f. Inflorescences mostly lateral, peduncles up to 6 cm. long; native of southwestern Hawaii.

9. *P. Terminalioides* var. *γ macropus.*

II. Natives of Kauai

a. Leaves of peduncles commonly much reduced and bracteiform.

b. Shrub ±1.5 meters tall; leaves glabrous even when very young, obovate-oblong, their blade 5–10 cm. long and 2–3.5 cm. wide; native of bog at very summit of Waialeale.

14. *P. Gayanum* var. *β waialealae.*

b. Trees or tall shrubs.

c. Leaves conspicuously reticulate with veins depressed above and salient beneath, when young covered on both surfaces with dark-brown or reddish-brown tomentum and in age remaining more or less so beneath, their blades mostly 4–10 cm. wide.....14. *P. Gayanum.*

c. Leaves moderately reticulate with but slightly depressed or salient veins.

d. Leaves glabrous, their blades mostly 2–5 cm. wide.

1. *P. acuminatum* and vars.

d. Leaves mostly more or less white- or brown-setose beneath with appressed setae (or if not, then the branchlets conspicuously brown-tomentose), their blades 4–8.5 cm. wide.

e. Capsules mostly 2–3 cm. long.....15. *P. flocculosum.*

e. Capsules 1.1–1.8 cm. long.

f. Sepals lanceolate to ovate, acute at apex, pubescent or irregularly glabrate, 1.5–2 mm. long; corolla slender, tube 4–7 mm. long, oblong lobes 2–3 mm. long; pedicels very delicate.

17. *P. kauaiense* and vars.

f. Sepals widely ovate, obtuse at apex, tomentose, 4–5.5 mm. long; corolla-tube about 7–8 mm. long, -lobes ovate and ±5 mm. long; pedicels robust. 18. *P. napaliense.*

a. Leaves of peduncles only moderately reduced and not bracteiform; capsules in age more or less glabrescent, their valves marked lengthwise with a median groove.....2. *P. Helleri.*

III. Natives of Lanai

a. Inflorescence axillary or cauline.

b. Mature leaves more or less tomentose (through perhaps very irregularly so) beneath.

c. Leaves numerous, crowded, small, their blade 6–8 cm. long and 2–4 cm. wide; capsular valves about 1.5 cm. long. 9. *P. Terminalioides* var. *ε lanaiense.*

c. Leaves few, subremote, their blade usually 8–12 cm. long and usually 3.5–5 cm. wide (very young leaves much flexed and densely fulvo-tomentose or fuzzy); capsular valves ±2 cm. long.....13. *P. cladanthum* var. *β gracilipes.*

b. Mature leaves usually glabrous or glabrate (rarely with a few straightish hairs) beneath.....6. *P. sulcatum* var. *β Remyi.*

a. Inflorescence now terminal now in the upper leaf-axils, seldom cauline.

b. Leaf-blades usually 3–7.5 cm. long and 1.3–3.5 cm. wide; capsules under 1.5 cm. long. 21. *P. confertiflorum* var. *δ microphyllum.*

b. Leaf-blades and capsules larger.

c. Capsules strongly rugose, 2–3 cm. long. 21. *P. confertiflorum* var. *β Mannii.*

c. Capsules smoothish or but slightly rugose, not or barely 2 cm. long.....22. *P. halophiloides.*

IV. Natives of Maui

a. Lower leaf-surfaces mostly appressed-tomentose or scurfy-hispid (hairs argenteous and often partly transformed into a very thin integument).....16. *P. argentifolium* and vars.

a. Lower leaf-surfaces glabrate, tomentose, tomentulose, or sparsely appressed-setose.

b. Leaves more or less brown- to red-woolly beneath.

c. Inflorescences axillary or cauline.

9. *P. Terminalioides* var. δ *mauiense.*

c. Inflorescences or at least some of them terminal.

21. *P. confertiflorum* and vars.

b. Leaves otherwise.

c. Leaves thickish, more or less glossy above, the reticulate venation conspicuous.

19. *P. insigne* and vars. β *Lydgatei* and γ *micranthum.*

c. Leaves thin, dull, their venation inconspicuously reticulate; capsules only mildly or minutely rugose, under 2 cm. long; native of southeasternmost East Maui.

3. *P. glabrum* var. ε *Tinifolium.*

V. Natives of Molokai

a. Leaf-blades mostly retaining at maturity much of the pubescence (this in age matted, appressed, grayish-white, somewhat scurfy) on their upper surface, commonly 5–8 cm. long and 1.8–3 cm. wide; species known only from Puu Kolekole..8. *P. Forbesii.*

a. Leaf-blades at maturity essentially glabrous or glabrate above.

b. Small shrub about 1 meter tall, litoral; leaf-blades obovate, mostly rounded at apex, only 3.5–6.5 cm. long but 2–3.5 cm. wide, even at maturity beautifully and densely tomentose underneath with a yellowish- or reddish-brown wool; known only from Kalawao of the north coast....12. *P. halophilum.*

b. Trees or tall shrubs, mostly 3–7 meters tall, rarely if ever litoral; leaf-blades mostly larger, in maturity glabrate to appressedly and more or less irregularly whitish-tomentose beneath.

c. Capsules mostly more or less erugose.

d. Capsules remaining at maturity more or less tomentulose.

3. *P. glabrum* var. β *spathulatum* and f. 1. *subcandidum.*

d. Capsules at maturity glabrate.

19. *P. insigne* var. δ *Hillebrandii.*

c. Capsules mostly rugose.

d. Capsules at maturity mostly glabrate.

e. Sepals mostly 0.5–0.6 the length of the corolla-tube.

6. *P. sulcatum.*

e. Sepals mostly 0.25–0.3 the length of the corolla-tube.

19. *P. insigne* var. *Fosbergii* and f. 1. *pertinax.*

d. Capsules at maturity remaining more or less tomentulose.

e. Leaf-blades ±2.9 dm. long and ±9–10 cm. wide.
19. *P. insigne* var. ζ *pelekunuanum.*

e. Leaf-blades commonly under 2 dm. long and under 7 cm. wide.....6. *P. sulcatum* var. β *Remyi.*

VI. Natives of Oahu

a. Leaves essentially glabrous beneath or but sparsely setose, unless when very young.

b. Capsules rugose and more or less sharply sulcate.

c. Capsules pubescent, especially in their furrows.
6. *P. sulcatum* var. β *Remyi* and var. γ *Rumicifolium* f. 1. *tomentellum.*

c. Capsules glabrate or only very sparsely pubescent.

d. Leaf-blades 12–20 cm. long and up to 5 cm. wide, commonly with a few appressed setae beneath near midvein; native west of the Koolau Mountains Divide.
7. *P. dolosum* var. β *aquilonium.*

d. Leaf-blades commonly smaller or, if not, *then* entirely glabrous beneath.

e. Leaves glabrous or glabrate, drying dark-green to somewhat brownish; a species widely distributed on Oahu.
6. *P. sulcatum* and var. γ *Rumicifolium.*

e. Leaves at least some of them with a few scattered, appressed hairs beneath, drying more brownish to reddish-brown; native of Land-Section Punaluu and of area slightly southwest.....7. *P. dolosum.*

b. Capsules not or but obscurely rugose..3. *P. glabrum* and vars.

a. Leaves mostly tomentose or very strigose beneath, unless in age.

b. Capsules definitely rugose and more or less sulcate.

c. Leaf-blades strigose or strigose-scurfy beneath, unless in age.

d. Leaf-blades 1–2.5 dm. long and 4–9.5 cm. wide.
15. *P. flocculosum.*

d. Leaf-blades 4–8 cm. long and 1.2–2.5 cm. wide.
10. *P. kahananum.*

c. Leaf-blades tomentose or tomentulose beneath, unless in age.

d. Inflorescence terminal (but the fruiting one finally often axillary by the development of a terminal shoot).
21. *P. confertiflorum* var. β *Mannii.*

d. Inflorescence axillary or cauline.
13. *P. cladanthum* and var. γ *reticulatum.*

b. Capsules erugose or but slightly rugose, not definitely sulcate.

c. Leaf-blades strigose or strigose-scurfy beneath, unless in age.
15. *P. flocculosum.*

c. Leaf-blades tomentose or tomentulose beneath, unless in age.
11. *P. cauliflorum* and vars. β *pedicellatum* and γ *cladanthoides.*

ABBREVIATIONS USED FOR HERBARIA CITED

Arn.	Herb. Arnold Arboretum, Jamaica Plain, Massachusetts.
Berl.	Herb. Berlin Botanical Garden, Berlin-Dahlem.
Bish.	Herb. Bernice P. Bishop Museum, Honolulu.
Calif. Acad.	Herb. California Academy of Sciences, San Francisco.
Corn.	Herb. Cornell University, Ithaca.
Deg.	Herb. of Otto Degener, Waialua, Oahu, Hawaii Territory.
Del.	Herb. Delessert, Geneva.
Field	Herb. Field Museum of Natural History, Chicago.
Goth.	Herb. Arboretum Gothenburg, Sweden.
Gray	Herb. Gray, Harvard University, Cambridge, Massachusetts.
Kew	Herb. Royal Botanic Gardens, Kew.
Minn.	Herb. University of Minnesota, Minneapolis.
Mo.	Herb. Missouri Botanical Garden, St. Louis.
N.Y.	Herb. New York Botanical Garden, New York City.
Par.	Herb. Museum of Natural History, Paris.
U.S.	Herb. United States National Museum, Washington.
Yunck.	Herb. Truman George Yuncker, Greencastle, Indiana.

1. **Pittosporum acuminatum** H. Mann, Enum. Haw. Pl. no. 22 (Proc. Amer. Acad. 7: 152). 1867.

a. Peduncle and axis of inflorescence glabrous or glabrate even from first; native of southwestern Kauai.....var. β *leptopodum.*

a. Peduncle and axis of inflorescence more or less hispid or tomentose unless in old age.

b. Sepals mostly subulate to broadly lanceolate.

c. Leaf-blades commonly 1.5–2 dm. long and 4–6 cm. wide, -petioles 1–3.2 cm. long; capsular valves with a rough, lengthwise, median ridge; native of eastern Kauai.
var. δ *magnifolium.*

c. Leaf-blades commonly smaller, -petioles mostly 0.7–1.7 cm. long; capsular valves not or but imperfectly median-ridged; native of western Kauai.....*P. acuminatum* sensu stricto.

b. Sepals (at least of sterile flowers) widely ovate, at apex usually obtuse.

c. Leaves mostly 2–4.3 cm. wide, thickish, subglossy, on upper surface rather conspicuously reticulate-veined, the veins impressed above and salient beneath; peduncles numerously bracteate, bracts flagelliform, suberect, 5–9 mm. long; native of eastern Kauai.....var. γ *Degeneri.*

c. Leaves mostly 4–6.5 cm. wide, thinnish, dull, on upper surface subobscurely veined, the veins neither impressed above nor very salient beneath; peduncles commonly 1- or 2-bracteate with bracts 3–5 mm. long; native of southwestern Kauai.....var. ε *waimeanum.*

Small tree 4.5–6 meters tall, branches slender, youngest shoots densely and antrorsely appressed-hispid with brownish or "pale" setae. Leaves thin-chartaceous to subcoriaceous, widely to narrowly oblanceolate or subspatulate, apically acute to shortly acuminate, glabrous, minutely revolute, gradually narrowed below into a slender petiole ±1 cm. long or the upper ones subsessile, blade 8–17 cm. long and 2–4.5 cm. wide, often irregularly blackened on dull or at times glossy upper surface with patches of fungous infection (*Capnodium lanosum fide Rockii in herb.*). Sterile flowers from the uppermost leaf-whorl, in corymbose racemes of 2.5–5 cm. in length, or at times on long foliose axes with flowers single in axils of reduced leaves; pedicels ±2.5 cm. long, pubescent; bracts and sepals subulate, ±7 mm. long; corolla white, its tube about 11 mm. long, its lobes long and acute. Fertile flowers from subterminal or lower axils, in corymbose, 3–11-flowered racemes; peduncle slender (at anthesis ±0.5 mm. in fruit ±1.5 mm. thick), at first brownish-tomentulose but finally more or less glabrate and ligneous, commonly 4–8.5 cm. long, floriferous near top or at most usually in upper third but bracteate throughout length; bracts subulate, subsparsely tomentose, appressed or suberect, 3–8 mm. long, in age deciduous; pedicels delicate, brownish-tomentulose, 6–20 mm. long; sepals lanceolate-subulate or a few ovate, attenuate, dorsally glabrate, marginally ciliate or minutely more or less erose-laciniate, about 4–5 mm. long; corolla-tube 7–10 mm. long, lobes ovate or ovate-oblong, about 5 mm. long. Ovary densely brownish-tomentose; style delicate, gradually dilated upward, glabrate, usually exceeding the ovary;

stigma capitate. Capsule subglobose to thick-ovoid, subquadrate, densely brownish-tomentulose, deeply tuberculate-roughened and more or less wrinkled, 14–18 mm. long exclusive of the slender, persistent stylar beak (this when intact about 4.5–5 mm. long). Seeds comparatively few and plump, 6–7 mm. long.

Type specimen: Collected by *Horace Mann & William T. Brigham*, No. 603, at altitude of 3,000 feet, on the mountains above Waimea, Island of Kauai, 1864–1865 (Corn. and Gray).

Distribution: Western Kauai.

Specimens examined (all from Kauai): *Otto Degener* 10,987, in forest, Kokee Camp, June 26, 1926 (Berl.; Deg.; Field, 2 sheets); *Degener* 10,994, in forest, same locality, June 23, 1926 (Field); *Abbé Urbain Faurie* 14, Hanapepe, December, 1909 (Del., 2 sheets; Par.); *Faurie* 19, alt. 1,000 meters, Waimea, March, 1910 (Arn.; Del., 2 sheets); *Charles N. Forbes* 4-*K*, on ridge at foot of Kahili, July 8, 1909 (Berl.; Field, 2 sheets; Kew; Par.); *Forbes* 236-*K*, Wahiawa Mts., August, 1909 (Berl.; Bish.; Field; Kew); *Forbes* 856-*K*, Waimea Drainage Basin, July 3–August 18, 1917 (Bish.); *Forbes* 870-*K*, same locality and date (Bish.; Field; leaves smaller); *Amos Arthur Heller*, ridge west of Hanapepe River, July 17, 1895 (Field); *Heller* 2,456, on the Hanapepe and Wahiawa Watershed, June 28, 1895 (Arn.; Kew; Minn.); *Heller* (similarly) 2,456, on the ridge west of Hanapepe River, same date (Berl.; Bish.; Corn.; Field; Gray; Kew; N.Y.; Par.; U.S.); *Heller* (similarly) 2,456, same locality, Aug. 22, 1895 (Mo.; U.S.); *Mann & Brigham* 603 (type collection, Corn.; Gray); *Joseph F. Rock*, Kauai, October, 1916 (Bish.); *Rock* 2,017, not common, around Halemanu, February 14–26, 1909 (Arn.); *Rock* 2,031, Halemanu, same date (Bish.); *Rock* 2,032, same locality and date (Arn.); *Rock* 2,033, Mohihi, February 14, 1909 (Gray); *Rock* 5,221, in woods of Waimea, September 10, 1909 (Bish.; leaves smaller); *Rock* 5,222, same locality and date (Field; leaves small, as in *Rock* 5,221); *Rock* 5,223, same locality and date (Field; leaves small, as in *Rock* 5,221 and 5,222); *Rock* 5,224, Kauai, September, 1909 (Bish.; leaves small, as in *Rock* 5,221, 5,222, and 5,223); *Rock* 5,226, in woods, Kaholuamanu, September, 1909 (Gray; N.Y.); *Rock* 5,227, in woods, Waimea, "leaves infested with *Capnodium lanosum*," September 10, 1909 (Field; form connecting *Rock* 5,221, 5,222, 5,223, and 5,224 with typical form, as to leaf-size, of the species proper); *Rock* 5,229, same locality and date (Arn.); *Rock* 5,231, same locality and date (Arn.; leaves small); *Rock* 5,811, in woods back of Makaweli, September, 1909 (Arn.);

Rock 5,814, in woods above Makaweli, same date (Bish.); *Rock* 5,849, same locality, September 28, 1909 (Field); *Rock* 5,850, same locality and date (Arn.); *Mrs. Francis Sinclair, Jr., commun.* January, 1885, Haolanlii (Kauai?—I cannot find this locality on maps; Kew); *Carl Skottsberg* 1,023, between Kokee and Mohihi, Waimea, October 29, 1922 (Goth.).

Described by Rock (Indig. Trees Haw. Isls. 155. 1913) as "a very handsome, graceful tree with beautiful cream-colored, fragrant flowers." My description of the sterile flowers is taken from Hillebrand (Fl. Haw. Isls. 22. 1888), who had had opportunity to observe much material in the field. Hillebrand describes the sterile (male) flowers as fragrant but is silent as to fragrance for the fertile flowers. He describes the fertile flowers, in reality the inflorescence containing them, as coming from the lower leaf-whorls, but in many specimens the peduncles are practically if not indeed truly at the terminus of the branch. A special study should be made of the seeds of this species. On specimens representing several collections, the mature seeds are somewhat shorter and narrower, and noticeably thicker or more plump than for the other Hawaiian species of *Pittosporum*.

The late Dr. John Briquet, of the Delessert Herbarium at Geneva, made a critical study of several Hawaiian Island specimens of *Pittosporum*, in the year 1914. He wrote tentative diagnoses for several species believed by him to be new.[1] These diagnoses are filed with their respective specimens at the Delessert Herbarium. Faurie 19 was proposed by Briquet as a new species, differing from *P. acuminatum* (according to Briquet) in having the axis of its inflorescence tomentose and in having narrow leaves, the upper ones subsessile. Faurie 19 was collected, it may be observed, in the type locality of the species proper. It is not capable even of varietal segregation.[2]

For an apparent hybrid between *P. acuminatum* and *P. kauaiense* var. *phaeocarpum* see under that variety (p. 541).

[1] I cannot find in literature any publication of Briquet's work on these plants. Nor does Dr. B. P. G. Hochreutiner, Briquet's successor at Geneva, know of any such publication. Dr. Hochreutiner wrote me under date of January 8, 1940: "I know of no publication of Briquet concerning *Pittosporum*. I have only seen in our Herbarium some determinations with labels in Briquet's handwriting and sometimes with indications 'spec. nova.' I suppose that these were left in place till Briquet had the opportunity of publishing them, and that he never did."

[2] Briquet, without doubt, had contrasted Faurie 19 with the Delessert Herbarium specimens of Faurie 1, labeled *Pittosporum acuminatum* Mann. In Faurie 1 the axis of the inflorescence is indeed essentially glabrous (see var. *leptopodum*). But *P. acuminatum* proper had its peduncles and pedicels, as may be seen in its type collection (Mann & Brigham 603), tomentulose during anthesis, and thus would include Faurie 19.

Pittosporum acuminatum var. β **leptopodum** Sherff, Amer. Journ. Bot. 28: 20. 1941.

Leaves narrower and thinner, peduncle more slender and a little longer, also glabrate from the first; pedicels more slender, a little longer, glabrate; bracts filiform; sepals lanceolate.

Type specimen: Collected by *Abbé Urbain Faurie*, No. 1, alt. 1,000 meters, Waimea, Island of Kauai, March, 1910 (Par.).

Distribution: Southwestern Kauai.

Specimens examined: *Faurie* 1 (type, Par.: cotypes, Arn. 2 sheets; Del., 3 sheets); *Joseph F. Rock* 2,030, Kaholuamanu, March 3–10, 1909 (Field); *Rock* 17,139, same locality, October, 1916 (Bish.).

Pittosporum acuminatum var. γ **Degeneri** Sherff, Amer. Journ. Bot. 28: 20. 1941.

Bracts of the youngest branches very narrowly linear, conspicuous, more or less glabrous, up to 2 cm. long. Sepals (at least those of sterile flowers) widely ovate, at apex obtuse or sometimes acute or acuminate, dorsally glabrous or more or less pulverulent, 2.5–3.5 mm. long. Capsule unknown.

Type specimen: Collected by *Otto Degener & Emilio Ordoñez*, No. 12,617, six feet tall, on open, rainy ridge, Kalualea, Koloa, Island of Kauai, December 31, 1939 (Field).

Distribution: Eastern Kauai.

Specimens examined: *Degener & Ordoñez* 12,617 (type, Field); *Degener & Ordoñez* 12,618, bush, on sunny ridge, alt. 1,200 feet, Kawaiumakua, Anahola, December 26, 1939 (Berl.; Deg.; Field; flowers and fruits lacking); *Abbé Urbain Faurie* 13, Kilauea, January, 1910 (Arn.; Del., 2 sheets; leaf-blades up to 1.5 dm. long and 5.8 cm. wide, petioles long and slender as in var. *magnifolium*, inflorescences sessile and terminal, perhaps through bud injuries); *Harold Saint John & F. R. Fosberg* 13,469, erect shrub, 7 feet tall, flowers white, leaves pale green, in thick brush on very steep slope, alt. 1,320 feet, Laaukahi, Haiku, December 22, 1933 (Field).

While capsules are unknown, the various characters of leaf and inflorescence relate this form unmistakably to *P. acuminatum*, from which it may be distinguished by the widely ovate, not subulate, sepals of its sterile flowers. The numerous and conspicuous bracts (much reduced interverticillate leaves) occurring on the last portion of the branches seem likewise distinctive, most of them being much more elongate than in the species proper or in var. *magnifolium*.

The variety was named for Mr. Otto Degener, the well known authority on the Hawaiian flora, in appreciation of his invaluable aid in supplying numerous specimens of *Pittosporum* for my revisional study of the Hawaiian members of the genus.

Pittosporum acuminatum var. δ **magnifolium** Sherff, Amer. Journ. Bot. 28: 20. 1941.

Bracts of youngest branches (which are brown-tomentose) sharply subulate, commonly under 1 cm. long. Petioles slender, 1–3.2 cm. long; blades commonly 1.5–2 dm. long and 4–6 cm. wide, conspicuously acuminate, when nascent appressedly brown-hispid along the veins. Peduncle commonly under 2 cm. long. Capsule really more rugose, 1.7–2.3 cm. long; valves with a rough, lengthwise, median ridge.

Type specimen: Collected by *Rev. John M. Lydgate*, Kalihiwai, northeastern coast of Island of Kauai, in 1915 (Bish.).

Distribution: Eastern and north-central Kauai.

Specimens examined: *Abbé Urbain Faurie* 12, Wainiha, January, 1910 (Arn.; Del.); *Charles N. Forbes* 616-*K*, Hii Mts., October 20, 1916 (Bish.; Field; Mo.); *Forbes* 653-*K*, same locality, October 22, 1916 (Bish.; Field); *Forbes* 676-*K*, same locality and date (Bish.; Mo.); *Lydgate*, Kalihiwai, 1915 (type, Bish.); *Lydgate*, Waialua (Wailua) Mts., Pole Line Trail (Bish.).

Pittosporum acuminatum var. ε **waimeanum** Sherff, Field Mus. Bot. Ser. 22: 429. 1941.

Leaves thinner, blade often 1.3–1.7 dm. long and 4–6.5 cm. wide, not glossy, the small nerves obscure above; petiole slender, 1–3.5 cm. long; peduncles slender, commonly 1–3.5 cm. long, few- (more often 1- or 2-) bracteate, bracts narrowly subulate, 3–5 mm. long; sepals widely ovate, over much of their surface brown-pubescent, about 3 mm. long; capsule brown-pubescent nearly all over.

Type specimen: Collected by *Abbé Urbain Faurie*, No. 3, at altitude of 1,000 meters, Waimea, Isl. Kauai, March, 1910 (Par.).

Distribution: Known only from type locality in southwestern Kauai.

Specimens examined: *Faurie* 3 (type, Par.: cotypes, Arn.; Bish.; Del.).

2. **Pittosporum Helleri** Sherff, Amer. Journ. Bot. 28: 23. 1941.

In habit of foliage very similar to *P. acuminatum*. Leaves more often 10–12 cm. long and 2–3 cm. wide, commonly smoother.

Peduncle of female inflorescence (at least finally) glabrous, 3–8-flowered, at times truly terminal; more often axillary, elongate, branch-like and foliose with leaves 4–10 cm. long and 1–2 cm. wide; pedicels slender, at anthesis very shortly spreading-hispidulous and ±1 cm. long, finally glabrous and perhaps a little longer. Flowers unknown. Capsule ovoid, quadrate, at base rounded or truncate, at first densely brown-tomentose but finally more or less glabrescent; valves tuberculate-rugose, cordate at base, marked lengthwise with a median groove, 1.5–2.4 cm. long (excluding the slender, ±5 mm. long style) and subequally wide.

Type specimen: Collected by *Amos Arthur Heller*, No. 2,783, on Kaholuamanu, above Waimea, Island of Kauai, September 2–9, 1895 (Gray).

Distribution: Known only from type locality in southwestern Kauai.

Specimens examined: *Heller* 2,783, on Kaholuamanu, above Waimea, August 30, 1895 (Field); *Heller* (similarly) 2,783 (type, Gray: cotypes, Arn.; Berl.; Field; Kew; Minn.; Mo.; N.Y.; Par.; U.S.); *Joseph F. Rock* 5,817, in woods above Makaweli, September, 1909 (Gray).

An interesting character is the leafiness of the peduncles, at least of those bearing the fertile flowers. At times these peduncles are definitely terminal, but in most cases they are axillary. In these latter cases, however, the leaves along the lower part may give the remaining terminal portion of the peduncle the appearance of being terminally placed on a leafy branch.

Heller misconstrued this species as representing *P. acuminatum*. From that species it may be separated at once by its leafy, not minutely subulate-bracted, peduncles, by the very minutely spreading-hispidulous, not tomentulose or glabrate, pedicels of the fertile flowers, and by the finally glabrate, not tomentose, capsules; also doubtless by several other characters yet to be ascertained when flowering specimens of both sexes are collected.

3. **Pittosporum glabrum** Hook. & Arn. Bot. Beech. Voy. 110. 1832; *Pittosporum Terminalioides* var. *glabrum* Hook. & Arn. *ex* Wawra, Flora 56: 168. 1873; *Pittosporum Fauriei* Lévl. *in* Fedde, Repert. 10: 121. 1911.

a. Leaves glabrous.

b. Peduncle and pedicels usually glabrous; capsules up to about 2.5 cm. long, essentially glabrous. . . *P. glabrum* sensu stricto.

b. Peduncles and pedicels pilose.

c. Pedicels much reduced, only ±1 mm. long.
var. δ *glomeratum*.

c. Pedicels commonly much longer.

d. Hairs of pubescence multiloculate; capsules up to 3.5 cm. long, glabrous or slightly tomentulose..var. γ *intermedium*.

d. Hairs of pubescence simple; capsules up to 2.7 cm. long, irregularly tomentulose..var. β *spathulatum* sensu stricto.

a. Leaves with more or less pubescence unless when old.

b. Leaf-blades somewhat appressed-tomentose beneath with commonly white or but rarely yellowish-brown hairs.

c. Leaves coriaceous, capsules whitish- or yellowish-tomentulose and ±2.5 cm. wide; plant native of Molokai.
var. β *spathulatum* f. 1. *subcandidum*.

c. Leaves membranaceous, capsules glabrate or very sparsely setose and ±1.7 cm. wide; plant native of East Maui.
var. ε *Tinifolium*.

b. Leaf-blades having mostly yellow tomentum; plant native of Oahu.....var. β *spathulatum* f. 2. *hypoleium*.

A shrub or small tree, 2–5 meters tall, glabrous throughout or somewhat pubescent on young shoots and rarely on floral bracts; branches with grayish bark. Leaves on slender branches, a few alternate the rest loosely verticillate, thin-coriaceous, spatulate to oblanceolate or rarely ovate-oblong, at apex rarely subtruncate or faintly emarginate but commonly rounded to obtuse or shortly acuminate, at margins very narrowly and only moderately revolute, gradually narrowed below into a subalate or alate petiole (this 0.5–1.5 or even –2 cm. long), the blade now 5–9 cm. long and 1.5–3 cm. wide now 9–13 cm. long and 2.5–3.8 cm. wide, drying to various shades of green (bluish- or grayish- to brownish-green) on upper surface and often to a paler- or more brownish-green on lower surface, the venation not or but slightly salient. Inflorescence usually quite glabrous, in axillary or terminal normal or subcorymbose sometimes subpedunculate but usually pedunculate racemes, these 6–15- (more rarely to 20-) flowered. Pedicels glabrous or glabrate, slender or sometimes even capillary, commonly 3–8 rarely up to 18 mm. long; their bracts subulate to linear-oblong or more often -lanceolate, glabrous or ciliate, mostly 1–3 mm. long; peduncle ±2 cm. long. Sepals ovate, obtuse to acuminate, glabrous, 1–1.5 (rarely –3) mm. long. Corolla pure white or cream-colored, its tube ±7 mm.

long in the fertile flowers and ±9 mm. long in the sterile flowers, the spreading lobes about 4–4.5 mm. long. Ovary glabrous. Capsule 2- or 3-valved, at first ovoid and pointed, smooth or roughish; at maturity green or greenish (but brownish to black in herbarium specimens), usually compressed-globose rarely compressed-ovoid, externally papillate and often transversely somewhat waved or wrinkled; after dehiscence the valves more or less flat, up to about 2.5 cm. long and subequally wide. Seeds black, shining, compressed, angular, dorsally smooth, 4–6 mm. wide.

Type specimen: Collected by *Lay & Collie* (of Captain Beechey's Expedition) on Oahu, 1826–1827 (Kew; a specimen in Delessert Herbarium, apparently intended for a duplicate, is seen from its one small immature capsule to be *P. sulcatum*).

Distribution: Island of Oahu.

Specimens examined: *Captain Beechey*, see *Lay & Collie; Edwin H. Bryan, Jr.*, Koolau Range, December, 1919 (Field); *Bryan*, alt. ±1,500 feet, Kawailoa Ridge, January 5, 1937 (Field); *Bryan* 790, small tree 4–5 meters tall, in small clump of remnant native forest, alt. 1,800 feet, extreme head of Manini Gulch, Waianae Mts., September 25, 1934 (Field); *William Bush & D. LeRoy Topping* 3,718, shrub 5–6 feet tall, on sunny bank, Waimalu Gulch, February 22, 1934 (Field); *Bush & Topping* 3,766, tree 15 feet tall, on shrubby hillside, Waimalu Ditch Trail, November 18, 1934 (Deg.; Gray; N.Y.; U.S.); *I. Chang*, in rain-forest, alt. 1,700 feet, south ridge of Kipapa Gulch, Waipio, Koolau Mts., May 15, 1932 (Field); *Degener* 10,976, in forest, Mt. Olympus, January 9, 1927 (Berl.; Deg.; Field); *Degener* 10,982, weak, somewhat straggling shrub, 6 feet tall, in forest, east ridge of Niu Valley, April 20, 1931 (Berl.; Deg.; Field, 2 sheets); *Degener* 13,001, in forest, Oio-Paumalu Trail, June 16, 1940 (Berl.; Deg.; Field, 2 sheets; form with some of the ovaries subrugose and when very young somewhat hispid, the pedicels at first glabrate or sparsely short-setulose); *Degener & H. Ochiae* 10,988, on exposed ridge in tapestry forest, ridge northeast of Nuuanu Pali, November 20, 1926 (Field); *Degener, Park, Potter, & Shigeura* 10,812, on lantana-covered foothill, Waimalu Gulch, November 3, 1935 (Deg.; N.Y.); *Degener, Park, & Kwon* 10,980, straggling shrub, with curving, weak branches, in rain-forest, Pupukea-Kahuku region, December 6, 1931 (Berl.; Deg.; Field, 2 sheets); *Degener, Salucop, & Arlantico* 11,535 *pro parte*, in lower forest, C.C.C. Trail, Aiea, December 6, 1937 (Field, 2 sheets; N.Y.; some of the capsules rugose and suggesting possible hybridization with

P. sulcatum); *Degener, Takamoto, & Martinez* 10,799 *pro parte,* in forest, C.C.C. Trail, Aiea, March 15, 1936 (Deg.); *Degener, Takamoto, Tam, & Martinez* 10,798 *pro parte,* in lower forest, east ridge of Manoa Valley, March 29, 1936 (Corn.; Deg.; Gray; Mo.; N.Y.; U.S.; *cum P. acutisepalo commixta*); *Miss K. Duker,* in wet forest, Manoa Cliff Trail, Manoa Valley, July 13, 1933 (Field); *Abbé Urbain Faurie* 4, alt. 600 meters, Kalihi, October, 1909 (Arn.; Del.; Par.); *Faurie* 5, alt. 800 meters, Konahuanui, May, 1910 (Arn.; Del.; Par.); *Faurie* 18, Kalihi, October, 1909 (Bish.; Del.; Léveillé's first cited number of his *Pittosporum Fauriei*); *Faurie* 38, same place and date (Par.; cited by Léveillé for his *P. Fauriei;* reduced *in herb.* by Joseph F. Rock to *P. glabrum*); *Charles N. Forbes* (with *J. F. G. Stokes*), Lanihuli Ridge, June 28, 1908 (Field); *Forbes,* west side of Nuuanu Valley above Pali, July 25, 1908 (Bish.); *Forbes,* ridge, west Kalihi Valley, August 18, 1908 (Field); *Forbes,* ridge, west of Kalihi Valley, December 24, 1908 (Field); *Forbes,* head of Kalihi Valley, April 2, 1909 (Field; Mo.); *Forbes* 1,080-*O,* valley and ridge, Nuuanu, January 27, 1909 (Bish.); *Forbes* 1,251-*O,* head of Kalihi Valley, April 2, 1909 (Bish.); *Forbes* (with *C. M. Cooke*) 1,610-*O,* east side of Nuuanu Valley, November, 1910 (Bish.; Mo.); *Forbes* 1,661-*O,* Pacific Heights, March, 1911 (Mo.); *Forbes* 1,898-*O,* central ridge of Niu, February 9, 1914 (Bish.); *Forbes* 1,943-*O,* ridge west of Waialae Valley, October 15, 1914 (Berl.; Bish.; Field; Mo.); *Forbes* 2,058-*O,* ridge north of Waimea Valley, February 10–13, 1915 (Bish.; Field); *Forbes* 2,181-*O,* Konahuanui ridges, March 11 and 12, 1915 (Bish.); *Forbes* (with *Mr. Labouchere*) 2,289-*O,* in upper Kalihi Valley, February 16, 1916 (Bish.; Field); *Forbes* (with *Albert S.* and *Ralph Hitchcock*) 2,399-*O,* on ridge between Palolo and Waialae, August 7, 1916 (Bish.); *Forbes* (with *J. C. Bridwell*) 2,432-*O,* Waialae Iki and Ridge, right-hand side, March 2, 1917 (Bish.); *Forbes* (with *J. C. Bridwell*) 2,459-*O,* ridge between Niu and Wailupe, April 11, 1917 (Bish.); *Forbes* 2,493-*O,* Manoa Cliff Trail, May 1, 1917 (Bish.); *F. R. Fosberg* 9,303, bush 2 meters tall, flowers white, with strong, sweet odor, on dry bluff, alt. 300 meters, ridge above Woodlawn, Manoa, March 19, 1933 (Berl.; Bish.; Del.; Field; Mo.; Par.); *Fosberg* 13,317, small tree 5 meters tall, in moist patch of forest, alt. 520 meters, at head of Keekee Gulch, Kuaokala Forest Reserve, Waianae Mts., November 8, 1936 (Bish.; Field); *Fosberg & K. Duker* 9,184, tree 4 meters tall, in wet forest, alt. 520 meters, Pupukea-Kahuku Trail, Koolau Mts., Kaunala, February 19, 1933 (Berl.; Bish.; Field); *V. O. Fosberg* 25, bush 3 meters tall, with white flowers, in wet forest, alt. 580 meters, Palolo-Waialae Ridge, Koolau Mts., May 24, 1936

(Berl.; Bish.; Field, 2 sheets); *D. Wesley Garber & C. N. Forbes* 186, ridge overlooking Niu and Wailupe Valleys, January 12, 1920 (Bish.); *A. A. Heller* 1,985 *pro parte*, Honolulu, March 22, 1895 (Corn.); *Heller* (similarly) 1,985 *pro parte*, in Nuuanu, March 23, 1895 (Field; Gray; N.Y.; Par.; U.S.); *William Hillebrand*, Oahu, 1869 (U.S.); *Hillebrand* 301, Oahu (Gray); *Hillebrand* 303, Oahu (Kew); *Hillebrand & Lydgate*, Oahu (Bish.); *E. P. Hume* 344, alt. 1,800 feet, on wooded slope, Manoa Cliff Trail, November 28, 1931 (Bish.; Field); *A. F. Judd* 26, flowers white, Kalihi region, November 4, 1925 (Bish.); *N. H. Krauss*, in wet forest, alt. 1,500–1,700 feet, Pupukea-Kahuku Trail, Kaunala-Waimea, Koolau Mts., February 19, 1933 (Berl.; Bish.; Field); *Krauss*, alt. 1,400–1,600 feet, Piko Trail, Kahanahaiki Valley, Waianae Mts., December 30, 1933 (Field); *Lay & Collie*, Oahu (type, Kew); *Horace Mann & William T. Brigham* 203 *pro parte*, Oahu (Bish.; Del.; Field, 2 sheets; Gray; *in* Kew, Mo., *alibique cum P. sulcato* var. *Remyi commixt.;* N.Y.; U.S.); *Jules Remy* 571, Oahu, 1851–1855 (Par.); *Joseph F. Rock*, without locality, October 3, 1908 (Bish.); *Rock* 19 (4,812), alt. 1,200 feet, east ridge, Niu Valley, August 22, 1909 (Bish.); *Rock* 710 *pro parte*, Pauoa Valley, November 4, 1908 (Field); *Rock* 990, Konahuanui, January 7, 1909 (Arn.); *Rock* 4,836, alt. 1,000–1,200 feet, slopes of eastern ridge, Niu Valley, August 22, 1909 (Bish.; Gray); *Rock* 4,839, alt. 1,000 feet, on the slopes of the eastern ridge, Niu Valley, August 22, 1909 (Arn.); *Rock* 8,721, alt. 2,000 feet, Niu Valley, December, 1910 (Arn.; Bish.; Gray; N.Y.); *Carl Skottsberg* 2,109, Pupukea-Malaekahana Trail, Koolau Range, September 15, 1926 (Bish.); *D. LeRoy Topping* 2,851, Niu Ridge, September 7, 1924 (Deg.; N.Y.); *Topping* 3,096, along Manoa Cliff Trail, April 12, 1925 (Deg.); *United States Exploring Expedition under Captain Wilkes*, Oahu (Gray; U.S.); *E. K. Yoshinaga, Pupukea*, January 12, 1930 (Bish.).

Much material of related species has been confused with *P. glabrum*, both in literature and in herbaria. Thus, for example, J. F. Rock (Indig. Trees Haw. Isls. pl. 55. 1913) illustrates the species with a full-page plate of what is instantly recognizable as *P. sulcatum* var. *Remyi*. A. A. Heller collected many specimens of *P. glabrum* in southeastern Oahu in 1895, distributing them under his number 1985. But under this same number he included certain additional specimens that prove to be *P. sulcatum*. These latter are at least in large part and doubtless entirely the basis of Heller's remarks (Minnesota Bot. Studies 1: 829. 1897): "In flowering specimens, collected on the lower slope of Konahuanui, and overlooking Nuuanu,

the pedicels are pubescent. With the exception of this pubescence, which apparently soon disappears, the specimens agree very well with the original description of *P. glabrum.*" (But the original description of *P. glabrum* was all too meager. A comparison with actual specimens of *P. glabrum* shows, for Heller's atypic specimens, not only pubescent pedicels but the proportionately longer sepals and the rugose fruits characteristic of *P. sulcatum.*) Aloysius Putterlick likewise was inaccurate in his treatment of *P. glabrum* (Synopsis Pittosporearum 11. 1839). For the binomial he cited its real authors, Hooker and Arnott, to be sure, but he based his description upon a plant collected by David Douglas, and a study of this description shows that Putterlick's plant was *P. Terminalioides.*[1]

Hillebrand (Fl. Haw. Isls. 22. 1888) set *P. glabrum* in that division of his key where the inflorescence was "axillary or cauline," not in part "terminal." But *P. glabrum* varies indiscriminately in this respect and its frequent terminal inflorescences may bear either fertile or sterile flowers. Indeed, on the type sheet at Kew, the right-hand one of the two specimens shows a terminal inflorescence.

Rock (*loc. cit.*), who evidently relied very largely upon Hillebrand, likewise classified *P. glabrum's* inflorescence as "axillary or cauline." E. Pritzel (*in* Engler & Prantl, Nat. Pflanzenfam. ed. 2. 18*a:* 278. 1930) accepted Rock's key bodily, merely translating it from English into German. We must note, however, that when Rock, subsequent to the publication of his key in 1913, made an extended herbarium study of Berlin and Paris specimens of *Pittosporum,* he included terminal as well as lateral inflorescences for *P. glabrum.* One instance was his reduction of the Paris specimen of Faurie 38, a number cited by Léveillé for *P. Fauriei* Lévl., to *P. glabrum.* On that specimen and several others cited by Léveillé for *P. Fauriei* Lévl., the inflorescences are distinctly terminal.

[1] Putterlick indeed cited a plant which "in insula Sandwicensium Oahu legit D. Douglas." But I know of no Oahu plants that Douglas collected. Horace Mann (Jr., Enum. Haw. Pl., Proc. Amer. Acad. 7: 144. 1867) states that when Douglas reached the Hawaiian Islands, "he immediately went to Hawaii, where he collected until the 12th of May, when he met a violent death . . . ." The only *Pittosporum* material seen by me that Douglas collected is his no. 20 at Kew and at Gray Herbarium. This is the type collection of *P. Terminalioides* Planchon *ex* A. Gray. The island whence it derived is not stated on the label, but the Kew label says "Sandwich Islands." The Gray Herbarium specimen had been labeled *P. Terminalioides* in Gray's own hand and, since Gray elsewhere (Bot. United States Explor. Exped. 1: 231. 1854) cited the one island, Hawaii, for that species and, furthermore, was familiar with and cited Putterlick's description of *P. glabrum,* it is evident that Gray did not give credence to Putterlick's citation of "Oahu" for the true source of the Douglas plant. (As to the quite different question, as to whether true *P. Terminalioides* is found on the Island of Oahu, see footnote under that species, p. 516.)

The precise status of *P. Fauriei* merits discussion here, inasmuch as its name antedates various others published at later dates for Hawaiian *Pittospora*. Léveillé's description (*loc. cit.*) included: "... folia oblongo-spathulata glaberrima in petiolum decurrentia; flores terminalia 4–6, umbellati conspicue pedunculati et pedicellati; corolla calice 4-plo longior; rachide glaberrima qua a *P. insigne* cui proximum distinguitur; sepala ovata, glaberrima, obtusa, petala obtusa; ovarium pilosum stylo crasso et dimidio longiore coronatum; fructus niger, levis, piriformis, stylo marcescente." Faurie 18 and 38 were cited, both from Kalihi (misspelled "Kaliki" by Léveillé but not by Faurie), Oahu, October, 1909. The type herbarium was not cited.[1] The Bishop Museum specimen of Faurie 18, the first cited number, is the only one known to me labeled fully in Léveillé's own hand. This, however, is barely a fragment and it is obvious that he really used associate specimens, doubtless the ones at Delessert Herbarium and at Paris, for his description. These latter two match the description closely. From the glabrous leaves and inflorescence, the very short calyces, and the glabrous fruits, they are seen to belong to *P. glabrum*. The word "piriformis" evidently referred to the lone submature capsule on the Paris sheet of material. The Delessert sheet bears four submature capsules and these all are ovate or obovate to cordate-ovate in outline as they lie pressed on the paper. All five capsules are essentially smooth or erugose (*cf.* "levis" Lévl. *loc. cit.*), as in *P. glabrum* proper, but show somewhat a tendency to have the flattish surface sulcate or sulculate. *P. glabrum* occasionally presents capsules of this type, thus offering a slight approach (as to capsules only) toward *P. sulcatum*.[2] Whether this approach connotes hybridism is not known, but in no case could the type materials of *P. Fauriei* be taken as typifying the sister

[1] The Faurie plants were disposed of to several large institutions (among them the Arnold Arboretum, the Bernice P. Bishop Museum, the British Museum of Natural History, the Delessert Herbarium, the Royal Botanical Garden of Edinburgh, and the Museum of Natural History at Paris), and hence the actual types of Léveillé's numerous "new species" (which in the case of the Hawaiian flora he founded on Faurie's plants and most of which have since been reduced by other workers to synonymy) came to rest in widely scattered herbaria. In the genera studied by me for the Hawaiian Islands so far (*Bidens* L., *Dubautia* Gaud., *Euphorbia* L., *Haplostachys* [A. Gray] Hillebr., *Labordia* Gaud., *Lipochaeta* DC., *Phyllostegia* Benth., *Pittosporum* Banks, *Raillardia* Gaud., *Stenogyne* Benth., and *Tetramolopium* Nees von Esenb.) Léveillé's personally labeled specimens were mostly at Paris, but occasionally at Bishop Museum and at Delessert Herbarium. For many groups, however, the actual types are said to be elsewhere, notably at Edinburgh.

[2] The ovaries, described as pilose by Léveillé, are glabrous except for a few hairs that seem to be merely portions of fungous hyphae.

species, *P. sulcatum*, and thus compelling us to supplant the name *sulcatum* with the earlier name *P. Fauriei*.

Pittosporum glabrum var. β **spathulatum** (Mann) Sherff, Amer. Journ. Bot. 28: 25. 1941; *Pittosporum Terminalioides* var. γ Gray, Bot. U. S. Explor. Exped. 231. 1854 (as to Oahu material); *Pittosporum spathulatum* Mann, Enum. Haw. Pl. No. 20 (Proc. Amer. Acad. 7: 151). 1867; *Pittosporum Terminalioides* var. *spathulatum* Gray *ex* Wawra, Flora 56: 169. 1873; *Pittosporum glabrum* var. β Hillebr. Fl. Haw. Isls. 23. 1888.

Leaves similar but usually a trifle more reticulate- and depressed-veiny on upper surface, and somewhat more salient-veiny underneath (the midvein often noticeably so). Peduncle short or long (up to 3 or rarely to 9 cm.), commonly cernuous, this and the pedicels (4–13 mm. long) densely or sometimes sparsely pilose. Sepals 2–3 mm. long, pubescent or finally glabrate. Ovary tomentose, the tomentum mostly persistent in irregular areas upon the mature, sometimes slightly larger capsule, this yellowish or yellow and up to about 2.7 cm. long.

Type specimen: Collected by *Horace Mann & William T. Brigham*, No. 602, on Kaala Mountains, Waianae Range, Oahu, May, 1864–May, 1865 (herbarium not cited). As may be seen from Mann's description of the stamens, "staminibus petalis plus dimidio brevioribus," he had before him only pistillate flowers. A large, numerously flowering spray of staminate material (Herb. Corn.) had been collected by him, however, and had been erroneously construed by him as *P. glabrum*. On the same sheet with this spray (at the lower right), and likewise construed, is a smaller, fruiting specimen of *P. sulcatum* var. *Remyi*, the evident source of Mann's description, "capsula globosa tuberculato-rugosa," for the fruit of *P. glabrum*.[1]

Distribution: Islands of Molokai and Oahu.

Specimens examined: Molokai.—*C. N. Forbes* 73-*Mo*, Kalae, June, 1912 (Field); *Forbes* 429-*Mo*, Pukoo Ridge, August, 1912 (Berl.; Bish.; Field; Gray); *Forbes* 569-*Mo*, Wailau Trail, September, 1912 (Bish.; Field); *William Hillebrand*, Kalae, 1870 (Gray; Kew); *H. St. John, J. Dunn, & Wm. Storey* 13,267, tree, 18 feet tall, in moist woods, alt. 2,200 feet, Kukuinui Ridge, Wailau Valley, July 4, 1933 (Field).

[1] The Mann & Brigham 203 sheet at Kew similarly bears (at upper left) a spray of *P. sulcatum* var. *Remyi*, but has commixed (at upper right) a subflowering specimen of true *P. glabrum*.

Oahu.—*Erling Christophersen, G. P. Wilder, & E. Hume* 1,492, in open forest, alt. 300–500 meters, at head of Kalihi Valley, January 25, 1931 (Field); *Otto Degener & Kwan Kee Park* 11,001, in forest, southeast side of Makua Valley near its head, January 31, 1932 (Field); *C. N. Forbes,* Makaha Valley, February 12–19, 1909 (Bish.; Field); *Forbes* 1,676-*O,* Palehua, Waianae Range, April 1–4, 1911 (Field; Mo., 2 sheets); *Forbes* (with *Mr. Labouchere*) 2,316-*O,* on ridge at left side of Kalihi Valley, March 9, 1916 (Bish.); *Francis Raymond Fosberg* 9,460, slender tree 5 meters tall, fruit yellow, aril dark brown, in wet forest, alt. 530 meters, Kalauao-Waimalu Ridge, Koolau Mts., April 30, 1933 (Bish.; Field); *Fosberg & Miss Katherine Duker* 9,070, bush 2.5 meters tall, fruit yellow, on bare, dry ridge, alt. 480 meters, Makua, Waianae Mts., November 25, 1932 (Field); *William Hillebrand,* Hawaiian Islands (U.S., 2 sheets); *Hillebrand & Rev. John M. Lydgate,* Oahu (Bish.); *E. Y. Hosaka* 629, alt. 1,700 feet, on moist, wooded slope, south ridge, Kipapa Gulch, Waipio, Koolau Range, July 4, 1932 (Field); *Hosaka* 699, alt. 2,000 feet, on wooded south ridge, Kipapa Gulch, Waipio, September 18, 1932 (Field); *Hosaka* 959, tree 15–20 feet tall, alt. 1,800 feet, on wooded south ridge, Kipapa Gulch, April 2, 1933 (Bish.; Field); *A. F. Judd* 25, Kaalakei (*i.e.,* Keawaawa), Maunalua district, February 13, 1928 (Bish.); *N. H. Krauss,* alt. 1,200–1,300 feet, Makua Valley, Keaau-Makua Forest Reservation, Waianae Mts., November 25, 1932 (Bish.); *Horace Mann & William T. Brigham* 203 *pro parte,* Oahu (Corn., *cum P. sulcato var. Remyi commixt.*); *Mann & Brigham* 602, Kaala Mts. (Corn.; Gray; Mo.; U.S.); *Jules Remy* 572 *pro parte,* Oahu, 1851–1855 (Gray; Par.); *Rock, Swezey, Bridwell, & Timberlake,* right-hand branch of Wailupe Valley, April 14, 1918 (Berl.; Bish.; Field); *Amy Suehiro,* Laie Ridge, Koolau Range, February 14, 1932 (Bish.); *D. LeRoy Topping* 2,890, Niu Ridge, October 3, 1924 (Deg.); *United States South Pacific Exploring Expedition under Captain Wilkes,* Oahu, 1840 (Gray); *M. Yamaguchi* 1,249, alt. 1,750 feet, south ridge, Kipapa Gulch, Koolau Range, July 4, 1932 (Field).

According to Hillebrand (Fl. Haw. Isls. 23. 1888), a form similar to this variety but "with acuter and more tomentose sepals is common on Molokai." It is very likely that at least some of the material which he had in mind belonged to *P. sulcatum* or its variety *Remyi* or to *P. insigne* var. *Hillebrandii,* all of which occur on Molokai. The var. *spathulatum* seems comparatively rare on Molokai, being known to me from that island only through the

two collections of fruiting material obtained by Forbes (Nos. 429-*Mo* and 569-*Mo*) in eastern Molokai, the single collection of atypic fruiting and scantily flowering material obtained by Hillebrand at Kalae in northern central Molokai, and the fairly typical specimen by St. John *et al.* (No. 13,267) from eastern Molokai.

The fresh, mature capsules are described by Fosberg and by Fosberg & Duker as yellow, whereas the comparable ones for the species proper are described as green or greenish. For further mention of this variety, see under *Pittosporum sulcatum.*

Pittosporum glabrum var. β **spathulatum** f. 1. **subcandidum** Sherff, Field Mus. Bot. Ser. 22: 411. 1941.

Foliar blades clothed irregularly and sparsely on lower surface (petioles and young shoots densely) with appressed and commonly white (rarely yellowish-brown) tomentum, or finally glabrate.

Type specimen: Collected by *Francis Raymond Fosberg,* No. 13,402, tree, 5 meters tall, at edge of moist forest, alt. 600 meters, Manawai-Kahananui Ridge, Molokai, December 24, 1936 (Field, 2 sheets).

Distribution: Southeasternmost Molokai.

Specimens examined: *Fosberg* 13,402 (type, Field, 2 sheets: cotypes, Berl.; Bish.).

The type specimens lack flowers but have a total of ten mature fruits. These are identical with those of var. *spathulatum* proper found on Oahu (type locality for that variety) and the only distinctive character remaining appears to be that of the tomentum on the youngest shoots, on the under surfaces of the leaves, and on the petioles when young. The leaves and youngest shoots of var. *spathulatum* proper are regularly glabrous.

Pittosporum glabrum var. β **spathulatum** f. 2. **hypoleium** Deg. & Sherff *ex* Sherff, *loc. cit.*

Similar to f. *subcandidum* but the pubescence for the most part yellow. On the type the pubescence is accompanied by considerable pulverulence but this appears to be foreign.

Type specimen: Collected by *Otto Degener & H. Ochiae,* No. 10,988*a*, on exposed ridge in tapestry forest, ridge northeast of Nuuanu Pali, Oahu, November 20, 1926 (Field).

Distribution: Southeastern Oahu.

Specimens examined: *Degener & Ochiae* 10,988*a* (type, Field).

The large spray of the type sheet lacks flowers but is accompanied by a mature capsule, this in a separate packet.

Pittosporum glabrum var. γ **intermedium** Sherff, Field Mus. Bot. Ser. 22: 410. 1941.

Inflorescence cauline or axillary, conspicuously spreading-pilose with brown multiloculate and minutely glandular-capitate hairs, the staminate ±9-flowered, its short peduncle under 6 mm. long, the slender pedicels under 8 mm. long, their bracts subulate and under 3 mm. long, the subulate-lanceolate sepals dorsally glabrescent and 4–5 mm. long; pistillate inflorescence up to 14-flowered, peduncle finally up to 1.2 cm. long, pedicels thickish and shorter, the broader sepals ovate-attenuate and more pubescent. Capsules glabrous or weakly and irregularly tomentulose, their valves up to 3.5 cm. long and 2.9 cm. wide. Seeds up to 7 mm. long, 5 mm. wide, 4 mm. thick.

Type specimen: Collected by *Charles N. Forbes*, No. 1,676-*O*, Palehua, Waianae Range, Island of Oahu, April 1–4, 1911 (Bish.).

Distribution: Known only from southwestern Oahu.

Specimens examined: *J. C. Bridwell*, Oahu, 1917 (Bish., 2 sheets); *Forbes* 1,457-*O*, on ridges behind Pearl City, February 24, 1910 (Mo.); *Forbes* 1,676-*O* (type, Bish.: cotypes, Berl.; Field).

The pilose inflorescence distinguishes this variety from the species proper and somewhat suggests var. *spathulatum*, but the multiloculate and glandular nature of the hairs, also the more attenuate sepal-tips and larger, more nearly or even completely glabrous capsules offer a distinction from that variety.

Pittosporum glabrum var. δ **glomeratum** (Hillebr.) Sherff; *Pittosporum glomeratum* Hillebr. Fl. Haw. Isls. 23. 1888.

A small tree with slender, virgate branches, young shoots cinereous-pubescent. Leaves elongate-spatulate, at apex obtuse or barely acuminate, gradually narrowed from terminal fifth or sixth into a slender petiole (this 2–4.5 cm. long), blade up to 1.7 dm. long and to 3 cm. wide, chartaceous, glabrous. Peduncles axillary, bracteate, pubescent, 2.5–3.7 cm. long, with a dense cluster of almost sessile flowers at the apex, the lanceolate bracts 3–6 mm. long. Sepals ovate, obtuse, tomentose, 2–2.5 mm. long. Corolla white, its tube ±10 mm. long. Ovary tomentose. Fertile flowers on shorter peduncles. Capsule and seeds as in *P. glabrum* proper but seeds 8 mm. broad.

Type specimen: Collected by *William Hillebrand*, at Wailupe, Isl. Oahu, 1870 (Berl.).

Distribution: Known only from type locality in extreme southeastern Oahu.

Specimens examined: *Hillebrand*, Wailupe, 1870 (type, Berl.; studied through the fine and detailed photograph courteously presented to me by Dr. Ludwig Diels, Director of the Berlin Botanical Garden).

An extended search through herbarium material reveals no specimens matching Hillebrand's type. Rock, who had not as yet seen the type specimen, wrote (Indig. Trees Haw. Isls. 157. 1913) that *P. glomeratum* Hillebr. "comes very close to *P. glabrum* and is perhaps only a form of it." At Berlin the type sheet had been marked "bearbeitet für das 'Pflanzenreich'" by Moeser and the name *glomeratum* reduced to the rank of a mere *forma* under *P. glabrum*. On a different sheet, the sheet designated by me as "B" (see under *P. acutisepalum*, p. 499), Rock had later written (as translated by me from a photograph sent me by Dr. Diels): "I agree entirely with L. Moeser, *Pittosporum glomeratum* is in any case only a form of *P. glabrum*." My own judgment is that *P. glomeratum* is *specifically* affiliated, to be sure, with *P. glabrum* but is entitled to varietal rank under that species. Distinguishing characters are: the pedunculate *cluster of almost sessile* flowers, *pubescent* peduncle, tomentose sepals and ovary, etc.

Pittosporum glabrum var. ϵ **Tinifolium** Sherff, Field Mus. Bot. Ser. 22: 412. 1941.

Branches glabrate, not robust (less than 5 mm. thick on specimens seen). Leaves disposed toward tips of branches, youngest ones very pubescent but soon glabrous or on lower surface sparsely scurfy-setose, slenderly petiolate, petiole 0.5–2 cm. long; blade oblanceolate or oblongly elliptic-lanceolate, acuminate, membranaceous, subobscurely nerved, 6–11 cm. long and 2–3.3 cm. wide. Flowers unknown. Inflorescence (fructiferous) cauline, subsessile, capsules ±5. Capsule pedicellate, pedicel 4–10 mm. long; valves finally flat and more or less rounded, under 2 cm. long and 1.8 cm. wide, externally glabrate or very sparsely setose but (at least when dry) minutely rugose (under a lens appearing much convoluted), beak about 1.5 mm. long. Seeds black, more or less flat, angulate, glabrous and smoothish on faces.

Type specimen: Collected by *Charles Noyes Forbes*, No. 1,668-*M*, on ridge at side of Kipahulu, East Maui, November 17, 1917 (Bish.).

Distribution: Known only from type locality in southeasternmost East Maui.

Specimens examined: *Forbes* 1,668-*M* (type, Bish.: cotypes, Berl.; Field).

4. **Pittosporum acutisepalum** (Hillebr.) Sherff, Field Mus. Bot. Ser. 22: 409. 1941; *Pittosporum glomeratum* var. *acutisepalum* Hillebr. Fl. Haw. Isls. 23. 1888.

Small tree, doubtless close to *P. glabrum* in general appearance. Leaves as in that species, except appressed-setose beneath when young, a few of the setae usually persisting till leaves reach nearly full size. Inflorescence terminal or lateral. Sterile flowers clustered at ends of short or long bracteate peduncles, sepals (narrowly lanceolate, ±4 mm. long) and bracts (filiform-subulate, 4–7 mm. long) dorsally whitish- or tawny-strigose with erect and few to many setae; peduncle (up to ±5 cm. long) and pedicels (usually 2–5 mm. long) similarly but more densely strigose; fertile flowers similar but few, often single in the axils, their pedicels more often on reduced peduncles (these as short as 1 mm.). Mature capsules unknown.

Type specimen: Hillebrand (*loc. cit.*) cited "Palolo to Niu" at the "eastern end of Oahu" as the type locality. There are two sheets of material in the Hillebrand set at Berlin, and through the courtesy of Dr. Ludwig Diels, Director of the Berlin Botanical Garden, photographs of these are now before me. One (referred to below as "A") bears merely "Oahu" for the type habitat, but the other (referred to below as "B") has "Niu" upon the label.

Distribution: Southeastern Oahu.

Specimens examined: *Erling Christophersen & Gerrit P. Wilder* 1,429 *pro parte*, in moist place, alt. 500–600 meters, East Palolo ridge, January 16, 1931 (Berl.; Bish.; Field, 2 sheets; a form with sepals often only 5 mm. but petals ±17 mm. long, entirely separate, and very slender; the flowering specimens of this set originally commixed by the collectors with mature fruiting specimens of *P. sulcatum*); *Otto Degener* 10,975, in rain-forest, Mt. Olympus, January 9, 1927 (Berl.; Deg.; Field); *Degener & Kwan Kee Park* 10,983, in forest, Wilhelmina Rise, November 11, 1931 (Berl.; Field); *Degener, Takamoto, Tam, & Martinez* 10,798 *pro parte*, in lower forest, east ridge of Manoa Valley, March 29, 1936 (Corn.; Del.; Mo.; *cum P. glabro commixta*); *J. Arthur Harris* C242,243 *pro parte*, Oahu, September 10, 1924 (Goth.); *Hillebrand*, Nuuanu (Kew).

Hillebrand (*loc. cit.*) correctly described the ovary of *P. glabrum* as glabrous. He omitted describing *P. glabrum's* mature capsules as glabrous, since among Hawaiian *Pittospora* glabrous ovaries never produce anything but glabrous capsules. In describing his new species *P. glomeratum* he gave the ovary as tomentose, but described the capsule as being the same "as in no. 2," *i.e.*, his *P. glabrum*. Thus, with Hillebrand, his own *P. glomeratum* was understood as having a tomentose ovary but a glabrous capsule. Still more, since its capsules were as in *P. glabrum*, they would be of the erugose, not rugose, kind.

In describing his *P. glomeratum* var. *acutisepalum*[1] he pointed out several differences but omitted all mention of the ovary and capsule. It is fair to assume that these were as in *P. glomeratum* proper, especially so since sheet "B" has at least two ovaries present and sheet "A" has at least two young capsules (about 1.2 cm. long) present, and Hillebrand thus had opportunity to make comparisons. It is impossible to be certain from the photographs whether the ovaries are indeed pubescent and the capsules finally glabrous, hence these questions must be left until fruiting material can be studied. However, the two young capsules visible in the photograph of sheet "A" are seen to be of the erugose type as in *P. glabrum* rather than of the rugose type as, for example, in *P. sulcatum*.[2]

As to the fruiting specimens so far available in herbaria, they all, so far as observed, are open to suspicion and must be rejected. Thus, for example, Degener *et al.* 10,798 was issued as pairs of specimens. In each case the flowering specimen was typical of *P. glabrum*. There were no interconnecting specimens whatever. In the case

[1] Spelled *acutisepala* by Hillebrand in his posthumously published Flora. I assume that he inadvertently used the feminine ending *a* in his mss. to accord with an understood "*varietas*" rather than to connote a substantive-plural use of the word. (Cf. his *Tetramolopium Chamissonis* var. *arbuscula* on p. 199, *T. arenarium* var. *dentata* on p. 200, and *Claoxylon sandwicense* var. *tomentosa* on p. 399 of the same work. In these last two cases he of course could not have intended a substantive use. In the case of the somewhat comparable *Panicum monticola*, published by him on pp. 494 and 500, it seems entirely possible that he was in fact thinking in terms of a substantive.)

[2] Both "A" and "B" sheets bear labels entitled, "Bearbeitet für das 'Pflanzenreich' " and determinations by Moeser in which the var. *acutisepalum* Hillebr. was synonymized with a *forma* of *P. glabrum*. Sheet "B" bears an extended comment by J. F. Rock in which he voices his substantial agreement with Moeser's treatment.

While further collections are desirable to reveal the capsular characters more definitely, we cannot ignore the fact that nowhere else (other than in the Nuuanu to Niu region) on the large Island of Oahu has the unique "*acutisepalum*" type of inflorescence been found. Moreover, this type of inflorescence is revealed with remarkable constancy throughout a suite of specimens collected over a period of more than seventy years.

of Christophersen & Wilder 1,429, two collections were made, likewise without transitional or intermediate stages to connect the two, under the same number. But here, while the flowering specimens were typical of *P. acutisepalum*, the fruiting ones were typical for *P. sulcatum* var. *Remyi*. It is to be hoped that several more collections will be made, but this time each from a single tree, the same tree being visited on different dates if necessary to secure both flowering and fruiting stages.

5. **Pittosporum amplectens** Sherff, Field Mus. Bot. Ser. 22: 407. 1941.

At least young portions of branches strongly appressed-hispid with brown setae. Leaves subnumerous, suberect, more or less terminally disposed, brownish-green when dry, hispid when young, oblong or (at times very broadly) oblong-oblanceolate, at apex acuminate, variable in size; petiole slender, glabrous or irregularly and very sparsely tomentose, 1–4 cm. long; blade now glabrous now especially beneath sparsely appressed-setose with slender, brown setae, above rarely subglossy, beneath conspicuously salient-veiny, now only 1 dm. long and ±2 cm. wide now commonly ±1.9 dm. long and ±6.5 (or even +8) cm. wide. Flowers not seen. Peduncles of pistillate flowers axillary or cauline, often subverticillately 2–3-clustered, at least finally subglabrescent, commonly 5–10 mm. long; pedicels up to about 10, mostly 3–5 mm. long. Capsules almost semimature often 6–9-clustered, smooth and glabrous, in outline oval-oblong, 1.5–1.7 cm. long (excluding the slender, ±3 mm. long style) and 1.2–1.4 cm. wide; a single mature valve seen, this subcordate-rounded in outline, externally smooth and glabrous, about 2.3 cm. long and ±2.6 cm. wide. Seeds black, smooth, under 6 mm. long and 5 mm. wide.

Type specimen: Collected by *Joseph F. Rock*, No. 8,384, Kohala, Island of Hawaii, June 20, 1910 (Bish.).

Distribution: Northwestern Hawaii.

Specimens examined: *Rock* 8,376, on the slopes and in crater of a small extinct volcano, west of Honokanenui, mountains of Kohala, June, 1910 (Arn.); *Rock* 8,384 (type, Bish.).

Smaller-leaved sprays, at least in the absence of flowers, offer an illusory resemblance to normal material of *P. glabrum* of Oahu, but can be told by the hairs persistent here and there underneath some of the leaves. Such sprays suggest *P. sulcatum* var. *Remyi* except that they have smooth and glabrous, not rugose and pubescent,

capsules. The seeds are rather small for the size of the mature capsule, thus leaving ample space in the capsular chamber. In this respect there is a resemblance to the mostly larger-fruited and otherwise very different *P. Hosmeri* and its var. *longifolium*, both of Hawaii. The very large leaves on most of the material examined call to mind, however, still other species and it is found that *P. amplectens* embraces in one combination an assortment of characters that elsewhere are more or less separately associated with diverse forms.

A tentative Greek-Latin name which Rock applied to both his No. 8,376 and his No. 8,384 in the herbarium indicated that they preferred marsh and forest.[1] Some of the largest leaves are much discolored with black patches, as in leaves, for example, of *P. Gayanum* of Kauai. In the case of *P. acuminatum*, Rock (*in herb.*) attributed such discoloration to the fungus, *Capnodium lanosum*.

6. **Pittosporum sulcatum** Sherff, Amer. Journ. Bot. 28: 26. 1941; *Pittosporum spathulatum sensu pro parte* Hillebr. Fl. Haw. Isls. 24. 1888, *non* Mann, Enum. Haw. Pl. No. 20 (Proc. Amer. Acad. 7: 151). 1867; *Pittosporum spathulatum sensu pro parte* Rock, Indig. Trees Haw. Isls. 157.[2] 1913 (*non* Mann).

a. Leaves especially numerous at tips of branchlets; their blades narrowly spatulate-oblanceolate, apically acute or gradually attenuate, basally elongate-attenuate; petioles slender, 1.5–3.5 cm. long; plants natives of small area, 21° 19–21′ N. Lat. and 157° 49′ W. Long., southeastern Oahu.

b. Capsules glabrous.....var. γ *Rumicifolium* sensu stricto.

b. Capsules more or less tomentulose.

var. γ *Rumicifolium* f. 1. *tomentellum*.

[1] Rock had labeled all of his material as a new species, but later, in his Indigenous Trees of the Hawaiian Islands (pp. 153–172. 1913), he omitted mention of it. This omission was covered by his general explanation which follows: "the writer wishes to state that he has gathered much material from localities where Pittosporums had never been recorded. Some of them undoubtedly are new, but owing to incomplete specimens, as the wanting of flowers, or mature capsules, the writer thinks it advisable not to include them in this already voluminous book, but rather to wait for additional material and then make an exhaustive study of this very variable group of plants." In not taking up Rock's unpublished herbarium name, I have followed the recommendations accompanying the International Rules.

[2] Rock's plates nos. 55 and 56 (meant by Rock respectively for *Pittosporum glabrum* H. & A. and for *P. spathulatum* Mann) are unquestionably referable here *specifically*, but they seem to show pubescent capsules, thus indicating var. *Remyi*.

a. Leaves variable but mostly otherwise in one or more respects; plants of broad distribution in Oahu, also scattered in Molokai and (var. β) Lanai.

b. Capsules glabrous or glabrate; mature leaves glabrous. *P. sulcatum* sensu stricto.

b. Capsules pubescent within (and sometimes weakly so between) the various furrows; mature leaves often sparsely setose beneath, particularly along median vein.....var. β *Remyi.*

Shrub or tree, 2–5 meters tall; branches rigid, numerous-leaved. Leaves alternate and subremote, or close together and subverticillate, darkish-green, glabrous or the youngest ones sometimes pilose, subcoriaceous, cuneately or obovately spatulate, more or less gradually narrowed all the way from the rounded or obtuse or weakly acuminate apex into an alate or subalate petiole, this 0.5–2.5 cm. long; blade now commonly 3.5–6.5 now commonly 5.5–9 (more rarely up to 15) cm. long and 1.5–3.5 (more rarely up to 6) cm. wide. Inflorescence commonly axillary (but sometimes terminal) and nearly similar for the two sexes, yellow- or brown-pubescent with more or less multiloculate and glandular-capitulate hairs, more often 5–8-flowered; peduncle commonly 4–12 (more rarely 25) mm. long; pedicels more often 3–7 mm. long, their subulate bracts sparsely pilose and 2–3 mm. long. Sepals of staminate flowers oblongly or widely ovate, at apex subobtuse or acute, dorsally ±7-striate and minutely pubescent or glabrate, subscarious toward base along the ciliate margins, 4–5 mm. long; of pistillate flowers narrower, at apex more attenuate, dorsally longer pilose and not striate, only about 2 mm. long. Corolla white or milk-colored, for staminate flowers the tube about 8–10 mm. long and scarcely surpassing the stamens, lobes oblong-ovate, apically obtuse or rounded, about 4–5 mm. long, the abortive pistil linear and toward base appressedly and antrorsely brown-hispid; for pistillate flowers, having a tube only about 6 mm. long, lobes as before but less than 3 mm. long, the minute stamens ±1.5 mm. long, ovary at first conspicuously appressed-hispid with yellow and commonly antrorse setae, the glabrous style about 4–5 mm. long and apically 2-lobed. Capsule subquadrangular, cuspidate, deeply sulcate, glabrous or very obsoletely pubescent, finally 1.5–3 cm. long exclusive of stylar beak (this ±3 mm. long) and equally or subequally thick. Seeds somewhat shining, black or reddish-black, compressed, angulate, irregularly and minutely somewhat ridged or roughened, about 7–9.5 mm. long and about 6–7 mm. wide.

Type specimen: Collected by *Nobue Tsuji*, in windy and rainy area at top of ridge, on side of Waikane-Schofield Trail, Waianaeuka, Koolau Mts., Island of Oahu, October 16, 1932 (Bish.).

Distribution: Islands of Oahu and Molokai.

Specimens examined: Oahu.—*Captain Beechey*, see *Lay & Collie; Erling Christophersen & Edward Hume* 1,419, alt. 500–750 meters, Kahuauli Ridge, December 17, 1930 (Berl.; Bish.; Field); *Christophersen & Gerrit P. Wilder* 1,429 *pro parte*, moist ground, alt. 500–600 meters, East Palolo ridge, January 6, 1931 (Berl.; Bish.; Field; *cum P. acutisepalo commixta*); *Hattie Davis*, alt. 2,325 feet, Waikane-Schofield Trail, Koolau Mts., October 16, 1932 (Bish.); *Otto Degener & Emilio Ordoñez* 12,053, small forest tree, C.C.C. Trail, Kawailoa, July 3, 1938 (Berl.; Field); *Degener, Ordoñez, & J. Kepaa* 12,774, in woods, Peahinaia Trail, April 28, 1940 (Berl.; Deg.; Field); *Degener, Park, et alii* 10,810, in forest, southeast slope of Kaala, February 2, 1936 (Deg.; N.Y.); *Degener, Park, & Topping* 11,020, in forest, C.C.C. Trail, Aiea, February 16, 1936 (Deg.; Field); *Degener & Felix C. Salucop* 11,201, in forest, on ridge north-northeast of Kaala summit, April 11, 1937 (Field); *Degener, Salucop, & Arlantico* 11,535 *pro parte*, in lower forest, C.C.C. Trail, Aiea, December 6, 1937 (Deg.; Field; Mo.); *iidem* 11,569, coarsely branched tree, 11 feet tall, in forest, alt. 2,400 feet, southeast slope of Kaala, December 19, 1937 (Berl.; Deg.; Field, 3 sheets; *forma foliis supra subnitidis lamina usque ad 15 cm. longa et ad 6 cm. lata*); *iidem* 11,570, in forest, alt. about 3,000 feet, same locality and date (Berl.; Deg.; Field); *Degener, Takamoto, & Martinez* 10,799 *pro parte*, in forest, C.C.C. Trail, Aiea, March 15, 1936 (N.Y.); *K. Duker*, in wet forest, Manoa Cliff Trail, Manoa Valley, July 31, 1933 (Bish.; Field); *G. R. Ewart, III*, half-way on Pupukea-Laie Trail, November 9, 1928 (Field); *Abbé Urbain Faurie* 2, alt. 600 meters, Kalihi, May, 1910 (Arn.; Del.; Par.); *Charles N. Forbes*, Koolauloa Mts. between Punaluu and Kaipapau, November 14–21, 1908 (Bish.; leaves very slightly appressed-setose underneath, thus suggesting var. *Remyi*); *Forbes*, Waiolani Ridge, Lanihuli Trail, September 17, 1908 (Bish.); *Forbes*, Waiolani Ridge, December 10, 1908 (Bish.; Field; capsular valves slightly pubescent near edges); *Forbes*, Makaha Valley, February 12–19, 1909 (Bish.); *Forbes*, Palolo Valley ridges, April 20, 1909 (Field); *Forbes*, ridge between Waialae Nui and Palolo, April 20, 1909 (Bish.); *Forbes* 1,433-*O pro parte*, on ridge, west side of Nuuanu Valley, January 7, 1910 (Mo.); *Forbes* 1,605-*O*, trail between Konahuanui and Olympus, November, 1910

(Bish.); *Forbes* 1,896-*O*, west edge of Palolo Crater, January 27, 1914 (Bish.); *Forbes* (*with Dean Lake*) 1,972-*O*, Waimanu Ridge, October 27–30, 1914 (Bish.; Mo.); *Forbes* (*with Dean Lake*) 1,987-*O*, same locality and date (Bish.); *Forbes* 2,220-*O*, Wahiawa Headgate Trail, August 17–20, 1915 (Bish.); *F. R. Fosberg* 9,453, in wet forest, alt. 500 meters, Kalauao-Waimalu Ridge, Koolau Mts., April 30, 1933 (Bish.; Field, 2 sheets); *Fosberg* 9,472, bush 2–3 meters tall, flowers white, in moist forest, alt. 550 meters, Kalauao Ridge, Koolau Mts., April 30, 1933 (Field); *Fosberg* 9,783, bush 2 meters tall, in wet forest, alt. 600 meters, Kipapa Gulch, Waipio, August 7, 1933 (Bish.; Field); *Fosberg* 9,787, bush 3 meters tall, flowers white, on wet, wooded ridge, alt. 750 meters, Kipapa Gulch, same date (Field, 2 sheets); *Fosberg* 10,329, bush, 3 meters tall, in wet forest, alt. 620 meters, ridge in southeast part of Makua Gulch, Hauula, Koolau Mts., October 15, 1933 (Field, 2 sheets); *Fosberg & Christophersen* 8,682, flowers cream-colored, in rain-forest, alt. 650 meters, ridge south of Kipapa Gulch, Waipio, September 18, 1932 (Field); *Fosberg & Duker* 8,790, shrub 3 meters tall, alt. 500 meters, in wet forest, on steep ridge, Waikane-Schofield Trail, Kahana, October 16, 1932 (Bish.; Field); *Gaudichaud*, without locality but doubtless from Oahu, 1819 (Del.); *J. Arthur Harris* C242,243 *pro parte*, without locality, September 10, 1924 (Minn.); *Constance Hartt*, in rain-forest, Kawailoa Trail, October 31, 1937 (Bish.); *A. A. Heller* 1,985 *pro parte*, in Nuuanu, March 23, 1895 (Berl.; Field; Gray; Kew; Minn.; Mo.); *William Hillebrand & Rev. John M. Lydgate*, without locality (Bish.; *sola capsula cum P. glabro commixt.*); *E. Y. Hosaka* 865, in wooded, moist forest, alt. 1,800 feet, south ridge, Kipapa Gulch, Waipio, November 27, 1932 (Field); *Hosaka* 1,179, tree 16 feet tall, on wooded ridge, occasional, alt. 2,000 feet, Kipapa Gulch, August 7, 1933 (Bish.; Field); *Noel H. Krauss*, alt. 1,600–1,800 feet, Manoa-Palolo Ridge, Koolau Mts., January 10, 1933 (Bish.); *Lay & Collie* (*Capt. Beechey's Expedition*), without locality (Del.; important as showing an immature capsule with very definite grooves; had been labeled in pencil, "*glabrum*," but differs in its fruit from the Lay & Collie type of *P. glabrum* at Kew); *V. MacCaughey*, Mt. Waiolani, October, 1914 (Bish.: Field); *Alfred Meebold* (*Otto Degener distrib. No.*) 10,801, Waikane-Kahana Trail, December, 1935 (Deg.); *Kazuto Nitta* (*Otto Degener distrib. No.*) 10,981, in forest, Pupukea region, January 12, 1930 (Field); *Joseph F. Rock*, in rain-forest, alt. 3,000 feet, slopes of Konahuanui (Arn.); *Rock*, Mt. Waiolani, October, 1914 (Arn.); *Rock &*

Ballou, Palolo Valley, November 30, 1912 (Gray); *Rock & Forbes* 783, Punaluu, November 14–21, 1908 (Arn.); *Rock & Holm*, Palolo, September, 1917 (Field); *Rock & Shaw* 10,072, Konahuanui, September, 1912 (Bish.); *Rock & Swezey* 12,581, Wailupe Valley, January 23, 1915 (Bish.); *Harold Saint John* 10,026, on wooded slope, alt. 1,300 feet, ridge south of Kipapa Gulch, Waipio, Koolau Mts., November 10, 1929 (Field); *Saint John* 11,196, shrub, 15 feet tall, on wooded ridge, alt. 1,900 feet, main ridge running southwest from Puu Lanihuli, Kalihi-Nuuanu, November 29, 1931 (Berl.; Bish.; Field); *Saint John* 11,556, shrub 10 feet tall, in woods, alt. 1,400 feet, Laie-Malaekahana Ridge, Koolau Mts., February 4, 1932 (Field); *Saint John* 13,038, shrub 15 feet tall, flowers white, fruits yellow, on wooded ridge, alt. 1,400 feet, Ewa Forest Reserve, Kalauao Ridge, March 29, 1933 (Field); *Olof H. Selling* 2,602, upper part of Kipapa Gulch, Koolau Mts., July 3, 1938 (Goth.); *Selling* 3,550, vicinity of Kaala, east side of Waianae Mts., September 25, 1938 (Goth.); Shaw, Palolo (Bish.); *Carl Skottsberg* 177, Nuuanu-Kalihi Ridge, Koolau Mts., August 13, 1922 (Bish.; Goth.); *Skottsberg* 895, Palolo, Koolau Mts., October 23, 1922 (Bish.; Goth.); *Skottsberg* 1,072, Nuuanu-Pauoa, Koolau Mts., November 5, 1922 (Goth.); *Skottsberg* 1,793, Malaekahana Trail, Pupukea, in Pupukea Forest Reserve, Koolau Mts., September 15, 1926 (Bish.; Goth.); *Amy Suehiro*, alt. 3,500 feet, Mt. Kaala, January 8, 1933 (Bish.); *Otto Swezey*, Koolau Mts. (Bish.); *Nobue Tsuji*, in windy and rainy area at top of ridge, on side of Waikane-Schofield Trail, Waianaeuka, October 16, 1932 (type, Bish.).

Molokai.—*Abbé Urbain Faurie* 11, Halawa, June, 1910 (Arn.; Del., 2 sheets); *William Hillebrand*, same locality, 1870 (Gray); *George C. Munro* 376 *pro parte*, Kamoku, June 5, 1916 (Bish.).

Glabrous- or essentially glabrous-fruited (*i.e.*, typical) forms of this species were referred by Hillebrand to species No. 4 in his treatment of *Pittosporum* (Fl. Haw. Isls. 24. 1888), already discussed elsewhere (Amer. Journ. Bot. 28: 26. 1941). Continuing the discussion there given, it may be noted that in the Museum of Natural History at Paris there are three more sheets of Remy 572, in addition to the sheet at Gray Herbarium, and that one of these likewise bears solely *P. glabrum* var. β Hillebr. (*i.e.*, my var. *spathulatum*). The other two bear exclusively (*the pubescent-fruited*) one of the two forms having "the suberiform epicarp deeply furrowed or runcinate" as described by Hillebrand for his *Pittosporum* No. 4,

i.e., his erroneously so-called "*P. spathulatum* Mann."[1] This important *pubescent-fruited* form which, together with my previously described *P. sulcatum* (*vide* p. 502), constitutes the species that has commonly passed as *P. spathulatum* among authors and collectors, is seen to have been without a valid name until recently[2] and is here treated as *P. sulcatum* var. *Remyi* (*vide infra*). (For remarks on a certain form of *P. glabrum* that slightly approaches *P. sulcatum*, see under *P. glabrum*, p. 493.)

Usually the nascent leaves are glabrous or glabrate but occasionally they are more or less densely pilose, as, for example, in Nitta (Degener distrib. No.) 10,981. This variation seems, however, to display all too much irregularity to warrant varietal segregation. I have, therefore, drawn the description of *P. sulcatum* proper to include forms with pilose nascent leaves.

Pittosporum sulcatum var. β **Remyi** Sherff, Amer. Journ. Bot. 28: 28. 1941; *Pittosporum glabrum sensu* Rock, Indig. Trees Haw. Isls., as to pl. 55. 1913; *Pittosporum spathulatum sensu* Rock, *op. cit.*, as to pl. 56.

Unlike species proper in its leaves, these commonly a little or much larger and on lower surface sparsely or at least along median vein often appressedly setose; also in its tomentose ovaries and in its mature capsules, these latter pubescent within (and sometimes obsoletely so between) the various furrows, both large and small. Frequently, too, the last one or two principal "internodes" of the branches are for a while densely appressed-hispid.

Type specimen: Collected by *Jules Remy*, No. 572 *pro parte*, on Island of Oahu, 1851–1855 (Par., 2 sheets).

[1] On the label for one of these last two sheets Asa Gray had written as a synonym (but erroneously): "*Pittosporum glabrum* Putterl.-*non* Hook." All three sheets of Remy 572 at Paris had been studied by Gray and he (incorrectly) had determined each as his *Pittosporum Terminalioides* var. γ (for disposition of the true *P. Terminalioides* var. γ Gray, see under *P. glabrum* var. *spathulatum*, p. 494).

[2] That Mann (*loc. cit.*) could not have had this form in mind when describing his *P. spathulatum* is shown by his words," capsula glabra fere laevi" and, "capsule nearly smooth." Strictly speaking, however, a fine tomentum can be discerned here and there on his mature capsules if a good lens be used. Mann had indeed collected this very form but had commixed it with specimens of *P. glabrum* (Herb. Kew) and of his *P. spathulatum* (Herb. Corn. Univ.). His description of the fruit of *P. glabrum*, "capsula globosa tuberculato-rugosa," clearly was drawn from his mislabeled fruiting specimens of this form. It is important to note, however, that the tuberculate-roughened ("tuberculato-rugosa") nature of the mature fruit was not overlooked by Mann. Without question, Mann's designation of the capsule of his *P. spathulatum* as "fere laevi" was intended to contrast it with the capsule of what he mistakenly supposed to be fruiting material of *P. glabrum*, thus confirming my treatment of his *P. spathulatum* as being referable (varietally) to *P. glabrum*.

Distribution: Islands of Oahu, Lanai, and Molokai.

Specimens examined: Oahu.—*J. C. Bridwell*, Waiolani Ridge, August, 1916 (Bish.); *F. B. H. Brown* 1,283, tree, rare, on slopes, alt. ±400 meters, Waimalu, December 31, 1925 (Bish.); *E. Christophersen, G. P. Wilder, & E. Hume* 1,665, in forest, alt. 300–500 meters, on middle ridge, Palolo Valley, March 26, 1931 (Bish.; Field); *Otto Degener* 10,984, in rain-forest, Pig-God Trail, Punaluu, May 31, 1931 (Berl.; Deg.; Field); *Degener* 13,004, in forest, Waipilopilo, Hauula, June 11, 1940 (Berl.; Deg.; Field); *Degener & Emilio Ordoñez* 12,375, in lower forest, east of Kanehoa, May 28, 1939 (Berl.; Deg.; Field); *Degener, Park, & M. Kwon* 11,003, Pig-God Trail, Punaluu, January 17, 1932 (Deg.; Field); *Degener, Park, Potter, Bush, & Topping* 10,811, in forest, Kipapa Trail, June 2, 1935 (Deg.; Field); *Degener, Salucop, & Arlantico* 12,074, in forest, Pupukea-Kahuku region, April 3, 1938 (Berl.; Deg.; Field, 2 sheets); *Charles N. Forbes*, Lanihuli Ridges, December 10, 1908 (Bish.); *Forbes* 1,433-*O pro parte*, on ridge at west side of Nuuanu Valley, January 7, 1910 (Bish.; Field; Mo.); *F. R. Fosberg* 9,556, tree 3 meters tall, in wet forest, alt. 400 meters, Kipapa Gulch, Waipio, June 12, 1933 (Field); *Fosberg* 9,772, bush, 3 meters tall, in wet woods, alt. 550 meters, Kipapa Gulch, August 8, 1933 (Bish.; Field); *Fosberg* 10,329, bush, 3 meters tall, in wet forest, alt. 620 meters, on ridge southeast part of Makua Gulch, October 15, 1933 (Berl.; Bish.; Field); *Fosberg* 10,354, bush, 3 meters tall, in moist forest, alt. 500 meters, same locality and date (Berl.; Bish.; Field); *Fosberg* 10,713½, small tree, flowers white, on wet, wooded ridge, alt. 550 meters, Palolo-Waialae Nui Ridge, Koolau Mts., December 27, 1934 (Field; mature capsules irregularly and sparsely tomentulose); *Fosberg & M. Chong* 9,416, bush, 2 meters tall, in wet forest, alt. 650 meters, Laie-Waimea Divide, Koolau Mts., April 15, 1933 (Bish.; Field; lacking flowers but having immature capsules, in leaf-habit approaching var. *Rumicifolium* of southern Oahu); *D. Wesley Garber* 218, Woodlawn Trail, February 1, 1920 (Bish.); *William Hillebrand* 301 *pro parte*, Koolau Mts. (Kew, 2 sheets; *cum specie ipsa commixt.*); *Edward Y. Hosaka* 555, alt. 1,100 feet, on south ridge, Kipapa Gulch, Waipio, May 15, 1932 (Field); *Hosaka* 592*a*, tree, 20 feet tall, in fairly moist gully, alt. 1,300 feet, 2nd north fork, Kipapa Gulch, June 26, 1932 (Field); *Hosaka* 921, on wooded ridge, alt. 1,800 feet, Kipapa Gulch, March 5, 1933 (Bish.; Field); *Hosaka* 1,023, alt. 1,700 feet, Kipapa Gulch, May 6, 1933 (Field); *Hosaka* 1,168, tree, 16 feet tall, on wooded slope, alt.

2,000 feet, Kipapa Gulch, August 7, 1933 (Bish.; Field); *Edward P. Hume* 163, alt. 560 meters, west ridge, Kaaawa, April 12, 1931 (Berl.; Bish.; Field); *Horace Mann & William T. Brigham* 203 *pro parte*, Oahu (Corn.; *in* Field, Kew *et* Mo. *cum P. glabro commixt.*); *Alfred Meebold*, Waiahole ditch trail, June, 1932 (Bish.); *Olaf Oswald* 3, spreading habit, crest of right ridge, about 0.5 mile from shore, Kahana, September 23, 1928 (Bish.); *Jules Remy* 572 *pro parte* (Par., 2 type sheets); *Joseph F. Rock*, Palolo, May 9, 1909 (Berl.; Field); *Rock* 25 (1,069), trail to Konahuanui, January 7, 1909 (Bish.); *Rock* 1,210, Waikane, January 12, 1909 (Bish.; N.Y.); *Rock* 1,213, Waikane Mt., January 23, 1909 (Bish.); *Harold Saint John* 11,081, flowers white, on wooded ridge, alt. 1,700 feet, North Ridge, Kaaawa Valley, April 12, 1931 (Bish.; Field); *St. John* 14,068, shrub, 15 feet tall, on east ridge, in open, lower woods, alt. 1,500 feet, Puu Kanehoa, Waianae Mts., January 7, 1934 (Bish.; Field); *Shaw*, Palolo (Arn.; or is this form better referred to var. *Rumicifolium* f. *tomentellum?*); *D. LeRoy Topping* 2,824, Bowman Trail, August 31, 1924 (Deg.); *United States South Pacific Exploring Expedition under Capt. Wilkes*, mountains behind Honolulu, about 1840 (Gray, where labeled by Asa Gray, "*P. glabrum?*"; U.S., labeled by A. Gray, "*Pittosporum glabrum*, Hook. & Arn. var.?").

Lanai.—*George C. Munro*, without locality (Bish.; the 7 fruits all singly disposed on separate peduncles 7–13 mm. long, pedicels absent).

Molokai.—*Otto Degener* 10,957, in forest, Kahuaawi Gulch, May 12, 1928 (Berl.; Deg.; Field); *Degener* 10,961, in windy forest, on cliff east of Kalaupapa Leper Settlement, June 19, 1928 (Berl.; Deg.; Field); *Degener* 10,962, in forest, Halawaiki Gulch, June 21, 1928 (Berl.; Deg.; Field, 2 sheets); *Charles N. Forbes* 509-*Mo*, ridges south of the Valley, Halawa, September, 1912 (Bish.); *Joseph F. Rock*, Halawa (Arn., 2 sheets; Berl.; Bish.; Field; Kew); *Rock* 8,720, Halawa, May, 1910 (Bish., 2 sheets).

Hawaiian Islands (island not cited).—*Gaudichaud*, October, 1836 (Del.); *Gaudichaud* 268, August, 1836 (Par.).

For remarks upon var. *Remyi*[1] see under species proper.

[1] That Hillebrand did not have this exact (pubescent-fruited) form in mind *when drawing the description* of his species no. 4 (intended for *P. spathulatum* H. Mann) is shown by his description of the ovary as "faintly pubescent." This would more accurately fit *P. sulcatum* proper (rather than its variety *Remyi*). Doubtless he overlooked the persistent pubescence of the mature capsules on Remy 572 when he included that plant after first citing his own material: "Oahu! in forests between Kalihi and Ewa."

Pittosporum sulcatum var. γ **Rumicifolium** Sherff, Field Mus. Bot. Ser. 22: 420. 1941.

Shrub or perhaps at times a small tree, ±2.5 meters tall. Leaves numerous, disposed at tips of branches, brownish-green when dry, petiole slender and 1.5–3.5 cm. long; blade narrowly spatulate-oblanceolate, at apex acute or gradually attenuate, at base elongately attenuate, above coriaceous and minutely impressed-reticulate, below manifestly salient-veiny, at first (when very immature) densely appressed-pilose, presently glabrate or glabrous, 6–13 cm. long and 1–2.5 cm. wide. Flowers unknown. Peduncles cauline or terminal, finally up to 5 or 8 mm. long, pedicels 3–6 mm. long. Capsule glabrous or glabrate; valves 1.8–2.5 cm. long and wide.

Type specimen: Collected by *F. R. Fosberg*, No. 8,973, bush, 2.5 meters tall, in wet forest, alt. 680 meters, peak at head of Pauoa Flats, Pauoa, Island of Oahu, October 30, 1932 (Field).

Distribution: Southeastern Oahu.

Specimens examined: *Otto Degener* 11,005, in sunny rain-forest, above Pauoa Flats, Honolulu, July 3, 1923 (N.Y.); *Fosberg* 8,973 (type, Field); *Joseph F. Rock* 10,073, Manoa Valley, September, 1912 (Bish.; Gray).

In its more slender and somewhat more congested leaves, this perplexing variety appears sufficiently separable from *P. sulcatum* proper, to which it is allied in its glabrate or even very glabrous capsules. In the shape of its leaves, however, it is closer to var. *Remyi*.

A duplicate of the sheet cited for Degener 11,005 is at Field Museum. This sheet bears two sprays remarkably identical, as to foliage, with the cited Degener material, but with the two capsules more or less tomentulose, as in var. *Remyi*. This form I have designated as:

Pittosporum sulcatum var. **Rumicifolium** f. 1. **tomentellum** f. nov.

Capsulae plus minusve tomentellae.

Type specimen: Collected by *Otto Degener*, No. 11,005 *pro parte*, in sunny rain-forest, above Pauoa Flats, Honolulu, Isl. Oahu, July 3, 1923 (Field).

Distribution: Known only from type locality in southeastern Oahu.

Specimens examined: *Degener* 11,005 *pro parte* (type, Field).

P. sulcatum var. *Rumicifolium* and its forma *tomentellum* might be construed by some writers as local forms, identical as to peculiar foliage, of *P. sulcatum* proper and its var. *Remyi*, respectively. A second interpretation is the one provisionally adopted here, namely, that the glabrous-fruited plants constitute a valid variety of *P. sulcatum* and that the tomentulose-fruited plant is a subordinate forma. A third interpretation might be that the material cited for var. *Rumicifolium* proper, although collected at intervals extending over a period of twenty years and all the while remaining unique, represents a teratological effect. Still a fourth interpretation might well be that we here have to do with hybridization and that the glabrate or glabrous versus the tomentulose capsules (of var. *Rumicifolium* and f. *tomentellum* respectively) represent a subsequent splitting apart of previously hybridized unit-characters. Future field observations and perhaps experiments are much to be desired.[1]

7. **Pittosporum dolosum** Sherff, Field Mus. Bot. Ser. 22: 421. 1941.

Leaf-blades 8–12 cm. long and 2–4.3 cm. wide.
P. dolosum sensu stricto.

Leaf-blades up to 2 dm. long and to 5 cm. wide. . var. *β aquilonium.*

Tree ±5 meters tall. Leaves crowded at tips of branches, often suberect, brownish-green or reddish-brown when dry, petiole 1–3 cm. long; blade spatulate-obovate, at base subelongate-cuneate, at apex more or less acuminate, at margin minutely also often coarsely revolute, 8–12 cm. long and 2–4.3 cm. wide; upper surface presently glabrous, subcoriaceous, often glossy, minutely impressed-reticulate; lower surface manifestly salient-veiny, at first (when very young) hispid, presently almost glabrate but commonly very sparsely appressed-setose. Inflorescence ±5-flowered, cauline or rarely terminal. Peduncle tomentose, 4–6 mm. long; bracts linear-subulate, subglabrate, under 5 mm. long; pedicels tomentose, 3–5 mm. long. Sepals ovate, pubescent, 3–5 mm. long. Corolla's tube 7–9 mm. long, lobes about 5 mm. long. Capsule oblong-ovoid or cordate-ovoid, rugose and sulcate, finally glabrate or very sparsely pubescent, 1.6–2.7 cm. long (the persistent, ±3 mm. long style excluded) and ±2 cm. wide. Seeds black, flat or flattish, smooth, 7–8 mm. long.

Type specimen: Collected by *Joseph F. Rock*, No. 418, Punaluu Mts., Island of Oahu, December 24, 1908 (Gray).

[1] It is quite possible that certain specimens collected at Palolo and other nearby localities and by me referred in this text to *P. sulcatum* or its var. *Remyi* will be found on further study to belong here.

Distribution: Northeastern Oahu.

Specimens examined: *Otto Degener, Kwan Kee Park, & Manuel Kwon* 11,003, in rain-forest, Pig-God Trail, Punaluu, January 17, 1932 (Deg.; Field; with foliar aspect of *P. sulcatum* and perhaps hybridized); *Abbé Urbain Faurie* 9, alt. 800 meters, Punaluu, May, 1910 (Arn.; Del.); *Charles N. Forbes,* between Punaluu and Kaipapau, Koolauloa Mts., November 14–21, 1908 (Bish.); *Forbes & Dr. C. M. Cooke, Jr.,* same locality, May 3–8, 1909 (Berl.; Bish.; Field); *Forbes, with C. L. Thompson,* same locality, May 8–13, 1909 (Berl.; Bish.; Field); *F. R. Fosberg* 9,540, tree, 5 meters tall, in wet forest, alt. 740 meters, divide between Kahana and Waianae Uka, Waikane-Schofield Trail, May 14, 1933 (Bish.; Field, 2 sheets); *Joseph F. Rock,* Koolau Mts., 1908 (Arn.); *Rock* 23 (173), same locality, December 3–14, 1908 (Field); *Rock* 23 (392), Punaluu, December 24–29, 1908 (Field); *Rock* 23 (781), same locality, December 3–14, 1908 (Kew); *Rock* 170 *pro parte,* Punaluu Mts., December 3–14, 1908 (Bish.); *Rock* 418 (type, Gray: cotype, Bish.); *Rock* 535, above the Valley of Kaliuwaa, Punaluu, December 24, 1908 (Arn.); *Harold Saint John* 10,584, on crest of ridge, alt. 2,200 feet, Punaluu, September 28, 1930 (Bish.; N.Y.); *Olof H. Selling* 3,676, Punaluu, September 27, 1938 (Goth.).

Rock, who had collected this species in the vicinity of Punaluu, northeastern Oahu, referred it to *P. spathulatum* Mann, by which he meant the recently named *P. sulcatum* (see p. 502). From *P. sulcatum* it differs in having its leaves mostly with a few scattered, appressed hairs on the lower surface, their venation usually more pronounced, their color usually more brownish or reddish-brown when dried, their position more nearly ascending or erect and their arrangement more compact, their margins more often loosely rolled underneath (independently of and in addition to the minute revoluteness present in most *Pittosporum* species), etc. The hairs of the lower surface may be lacking on several leaves but nearly always show on some, now toward the base now toward the tip but more consistently along the midvein. The geographic distribution appears restricted to the mountains of the Land-Section Punaluu and of the area slightly southwest.

Pittosporum dolosum var. *β* **aquilonium** Sherff, Field Mus. Bot. Ser. 22: 422. 1941.

Shrub ±2 meters tall or perhaps becoming a small tree. Leaves more elongate, petiole up to 4 cm. long; blade up to 2 dm. long

and 5 cm. wide, at apex more often acuminate. Ovary densely tomentose. Mature capsule subglabrate.

Type specimen: Collected by *Amy Suehiro*, on South Opaeula Ridge, Paalaa, Island of Oahu, September 25, 1935 (Bish.).

Distribution: Apparently frequent in the Land-Section of Paalaa, northern Oahu, and rare southward in Kipapa Gulch, Oahu.

Specimens examined:[1] *Otto Degener, Emilio Ordoñez, & Joe Kepaa* 12,779, in woods, Peahinaia Trail, April 28, 1940 (Deg.; Field); *F. R. Fosberg* 8,850, bush, 2 meters tall, in wet forest, alt. 500 meters, South Ridge, South Helemanu Gulch, Paalaa, September 25, 1933 (Bish.; Field); *Frank Kitamura*, on open, moist slope, alt. 1,450 feet, ridge of South Opaeula Gulch, Paalaa, September 24, 1933 (Bish.); *Harold Morley* 19, in moderate forest, alt. 1,600 feet, ridge south of South Opaeula Gulch, September 24, 1933 (Bish.); *Amy Suehiro*, South Opaeula Ridge, September 25, 1935 (type, Bish.).

The leaves commonly retain a few appressed setae close to the midvein, on the lower surface, and thus suggest *P. sulcatum* var. *Remyi*. They average much larger, however, than in that variety; moreover, the mature capsules are subglabrate, not pubescent, in most of the large and small surface grooves. They are approached in size by those found on some specimens of *P. sulcatum* proper of the Kaala region in Oahu. The numerous Kaala specimens examined for *P. sulcatum* proper, however, invariably have the leaves glabrous on both surfaces when mature. The foliar habit seems to place the type plant most logically as a variety under *P. dolosum*, from which it can be told easily by its larger leaves (their blades mostly 12–20 cm. not 8–12 cm. long). Var. *aquilonium*, furthermore, grows considerably west of the divide of the Koolau Mountains, while *P. dolosum* proper grows on the eastern side.

8. **Pittosporum Forbesii** Sherff, Field Mus. Bot. Ser. 22: 423. 1941.

Nascent branches pubescent. Leaves numerous, crowded toward tips of branches, their somewhat slender petiole 5–13 mm. long; blade obovate or widely oblong-oblanceolate, at apex obtuse or rounded, at base cuneate-narrowed, commonly 5–8 cm. long and 1.8–3 cm. wide, at first densely tomentose with reddish-brown or presently silvery tomentum, finally above (more rarely also below)

[1] A somewhat similar specimen by Noel H. Krauss, from the Pupukea-Kahuku Trail, alt. 1,400–1,600 feet, in the extreme north of Oahu, has a terminal raceme of anomalous, 4-merous flowers and cauline clusters of staminate flowers. It has been laid aside for more detailed investigation.

irregularly or sometimes almost entirely glabrous. Flowers unknown. Fruit-bearing inflorescences cauline, shortly (about 5–7 mm.) pedunculate, pedicels only 1–3 mm. long. Capsule small, 1.5–2 cm. long, in outline oblong-ovate; valves finally flat, obovate, under 2 cm. wide, outwardly at first tuberculate and densely whitish-tomentose finally almost glabrate and not tuberculate but under a lens much and minutely convoluted. Seeds intensely black, thick, 4–5 mm. long, rugose and convoluted all over unless on faces. Style at first scarcely 2 mm. long, finally (as a capsular beak) about 1–1.5 mm. long.

Type specimen: Collected by *Charles N. Forbes*, No. 122-*Mo*, on slopes of Puu Kolekole, Island of Molokai, July, 1912 (Bish.).

Distribution: Known only from type locality in southeastern Molokai.

Specimens examined: *Forbes* 122-*Mo* (type, Bish.).

Probably best regarded as a sister species to *P. Terminalioides*, a species not known as yet from the Island of Molokai. Indeed, the collector, Mr. Forbes, wrote of it on the type sheet: "Probably related to *P. terminalioides*. May be new. Glabrous small capsule. No flowers yet." *P. Terminalioides* is a species which usually can be identified rather easily and yet which varies so much in most of its characters as to invalidate most positions assigned to it in a key. It is probably best separated from *P. Forbesii*, aside from geographic considerations, by the upper surfaces of the leaves. These as a rule are soon glabrous or glabrate, while in *P. Forbesii* most of the upper leaf-surfaces retain over considerable areas a thin coating of densely matted, silvery hairs.

The species was dedicated to Mr. Forbes, who, before his death in 1920, had greatly assisted my studies with the collection and lending of numerous Hawaiian specimens.

9. **Pittosporum Terminalioides**[1] Planch. *in* Herb. Hook. *ex* A. Gray, Bot. U. S. Explor. Exped. 231. 1854; *Pittosporum glabrum sensu* Putterlick *pro parte*, Synops. Pittosporearum 11. 1839 (exclud. syn. Hook. & Arn.); *Pittosporum glabratum* Putterl. *pro parte ex*

[1] Planchon, the author of the name *Pittosporum Terminalioides*, had spelled the trivial name "*terminalioides*" on the type sheet at Kew. Asa Gray published the name with this same spelling. Hillebrand later (Fl. Haw. Isls. 22 and 24. 1888) altered the name by dropping the second *i*, perhaps through oversight or perhaps assuming that Planchon had been concerned merely with a falsely terminal inflorescence, in which latter case Hillebrand's spelling would be correct. However, the Kew type (now before me) shows no terminal inflorescence at all, although

Drake del Castillo, Ill. Fl. Ins. Mar. Pacif. 111. 1890; *Pittosporum glabratum* Putterl. *pro parte ex* Rock, Indig. Trees Haw. Isls. 159. 1913.

a. Peduncles up to 6 cm. long; native of southwestern Hawaii. var. γ *macropus*.

a. Peduncles under 2.8 cm. long.

b. Capsules up to 4 cm. long and to 2.9 cm. wide; native of eastern and southern Hawaii..... var. β *macrocarpum*.

b. Capsules under 3 cm. long.

c. Leaves coriaceous; capsular valves 2–2.8 cm. long; native of Hawaii..... *P. Terminalioides* sensu stricto.

c. Leaves often somewhat thinner; capsular valves commonly under 1.8 cm. long; native of Maui..... var. δ *mauiense*.

A stiff or rarely somewhat scandent shrub, 1.8–3 meters tall, terminal portions of branchlets grayish- to ferruginous-tomentose. Leaves conspicuously crowded near ends of branchlets; blade coriaceous, densely whitish- to ferruginous-tomentose on both surfaces when young, usually soon glabrous or glabrate and finely areolar-reticulate above, moderately salient-veiny and (usually becoming grayish-) tomentose or in age occasionally glabrate below, usually 5–12 cm. long and 1.5–4 cm. wide, spatulate to obovate, apically rounded or bluntly acuminate, basally tapering into a slender or more or less subalate petiole, this 0.5–4 cm. long. Inflorescence axillary or cauline, short, tomentose, peduncle thickish and commonly 1–2.5 cm. long,[1] the tomentose pedicels 2–6 mm. long. Fertile and sterile flowers occurring indiscriminately near ends of branchlets and on bare stem. Sepals lanceolate to ovate, apically acute, tomentose, 2–4 mm. long. Corolla cream-white, tube 5–9 mm. long, lobes half as long. Ovary tomentose. Capsule densely or moderately tomentose or except in small patches glabrate, flattened (rarely 3-valved and trigonous); valves 2–2.8 cm. long and

two detached capsules are glued to the sheet, just below the leafy spray; these evidently had been cauline in origin, as revealed by two or more remaining cauline pedicels. Moreover, the genus *Terminalia* L. (family Combretaceae) has many species that are resembled by *Pittosporum* species, Planchon's species among them, and there seems no doubt that Planchon meant to spell the trivial name exactly as he did, and in allusion to such a resemblance.

[1] Hillebrand (Fl. Haw. Isls. 24. 1888) gives the peduncle as ½–1 line long. This apparently was accepted as true by Skottsberg (Meddel. Göteborgs Bot. Trädgård 10: 109. 1936), in segregating as his var. *macropus* a form with peduncles up to 6 cm. long. Rock (*loc. cit.*) describes the peduncle as about 2 to 10 mm. long. In well developed material, however, peduncles 2–2.5 cm. long sometimes occur.

subequally or much less broad, with a usually shallow longitudinal median groove and usually some transverse waves (but not boldly sulcate or conspicuously rugose), when separated in age frequently orbicular in outline and very flat, the base at times subemarginate, the apex tipped with a stylar rostrum, this usually 1–2.5 but at times 5 or even 7–8 mm. long. Seeds rugose, usually dull, purple or brownish, 4–5 mm. in diameter.

Type specimen: Planchon had given the name *Pittosporum terminalioides* in the herbarium at Kew to a specimen, David Douglas 20, from the "Sandwich Islands." Since Douglas collected exclusively upon the Island of Hawaii, so far as his Hawaiian Island collections were concerned (*fide* H. Mann, Enum. Haw. Pl. [Proc. Amer. Acad. 7:] 144. 1867), it is clear that the Douglas plant came from Hawaii (*cf.* footnote under *P. glabrum*, p. 492). But Asa Gray was the first to publish a description and, while he parenthetically reported the species to have been "also collected by Douglas" (and indeed employed the specific name previously given by Planchon to the Douglas plant), he clearly had in mind principally the plants collected by the United States Exploring Expedition. He cited these as having been collected "on the coast southeast of the crater of Lua Pele and Puna. On Mouna Loa at an elevation of 7,000 feet." At least two specimens of the "Mouna" (*i.e.*, Mauna) Loa habitat are still extant (Par.; U.S.).

Distribution: Island of Hawaii.[1]

Specimens examined: *Otto Degener* 10,978, in dry *aa* desert forest, near Kaalualu, September 12, 1929 (Field); *Degener, Iwasaki, & E. B. Bartram* 10,979, partly climbing, in dry region, Kipuka Neenee (Kipuka Nene), January 27, 1930 (Field); *Charles N. Forbes* 274-*H*, Kealapuali (Koolapuuwale), Kona, June 29, 1911 (Bish.; Field, 2 sheets; Gray); *Forbes* 360-*H*, Kapua, Kona, July 25, 1911 (Berl.; Field; Gray); *Forbes* 368-*H pro parte*, Kau Desert, August 2, 1911 (Bish.; Field); *Forbes* 815-*H*, near the Lava Flow of 1899, June 12, 1915 (Berl.; Bish.; Field); *William Hillebrand & Rev. John M. Lydgate*, Hawaiian Islands (Bish.); *Horace Mann & William T. Brigham* 313, alt. 7,000 feet, Hualalai, 1864–1865 (Bish.; Del.;

[1] Hillebrand (Fl. Haw. Isls. 24. 1888) gives several localities on Hawaii but adds: "Lanai! A similar form from the low and dry hills of the east end of Oahu!" I have seen no material of *P. Terminalioides* proper from Lanai or Oahu and have been unable to examine the Hillebrand specimens in Berlin. It may of course be that for Lanai Hillebrand had in mind the form referred here to the var. *lanaiense*. As to material from Oahu, it may be pointed out here that Forbes 2,462–*O*, from a ridge between Niu and Wailupe, toward the extreme southeastern end of Oahu, had been annotated at Bishop Museum: "Hillebrand refers this to *P. terminaloides*." This specimen fits well, however, within the limits of *P. flocculosum* (*qu. vide*).

Gray); *Joseph F. Rock*, Manuka, Kau (Arn.; Bish.); *Rock*, Hawaiian Isls., November 7, 1912 (Field); *Rock* 10,075, Manuka, South Kona, January, 1912 (Gray); *Rock* 10,076, on slopes of Hualalai, alt. 7,000 feet, great central plain, February, 1912 (Bish.; Gray); *Rock* 13,031, Hilea lava flow, Kau, August, 1917 (Bish.); *United States South Pacific Exploring Expedition under Captain Wilkes*, alt. 7,000 feet, Mauna Loa, about 1840 (Par.; U.S.).

Pittosporum Terminalioides var. β **macrocarpum** Sherff, Amer. Journ. Bot. 28: 28. 1941.

Leaves commonly more acuminate, their tomentum beneath remaining mostly reddish-brown. Peduncles up to 6 mm. or at times up to 1.7 cm. long, pedicels at anthesis slenderish and longer (up to 11 mm.). Capsule ovate or oblong in outline, at first densely tomentulose but at last scatteringly or over a part of its surface subglabrate, larger, up to 4 cm. long excluding the beak and up to 2.9 cm. wide.

Type specimen: Collected by *Charles N. Forbes*, No. 431-*H*, Kapapala, Kau District, Island of Hawaii, August, 1911 (Bish.).

Distribution: Eastern and southern Hawaii.

Specimens examined: *Forbes* 431-*H* (type, Bish.: cotypes, Berl.; Field); *Forbes* 963-*H*, in forest, between Kipuka Waiakea and Keawewai, June 27, 1915 (Berl.; Bish.; Field); *William Hillebrand* 305, Hawaii (Kew; peduncle 1.5–1.7 cm. long); *Joseph F. Rock* 12,988, Kona Road, South Kona, August, 1917 (Bish.).

The leaves, while at first very tomentose on both surfaces, soon become glabrate or glabrous above, also often somewhat glaucous. Those of the Rock specimen show a similarity to those of *P. hawaiiense* of the same vicinity.

Pittosporum Terminalioides var. γ **macropus** Skottsb. Meddel. Göteborgs Bot. Trädgård 10: 109. 1936.

Leaf-blades 8–13.5 cm. long and 3–6 cm. wide, -petioles 2–3 cm. long. Peduncle up to 6 cm. long, pedicels up to 1 cm. long. Capsule oblong in outline, 2–2.7 cm. long excluding the beak and 1.5–2.4 cm. wide, remaining tomentose in age, the median, lengthwise groove deep and conspicuous, the transverse wrinkles early evident.

Type specimen: Collected by *Carl Skottsberg*, No. 619, at about 600 meters altitude, in dry land along Kau-Kona Road, between Pahala and Naalehu, Island of Hawaii, September 21, 1922 (Bish.).

Distribution: Known only from southwestern Hawaii.

Specimens examined: *Otto Degener* 10,993, in moderately dry region, north of Alika Lava Flow, August 26, 1926 (Field, where 2 of the 3 capsules are 3-valved);[1] *Skottsberg* 619 (type, Bish.: cotype, Goth.).

Pittosporum Terminalioides var. δ **mauiense** Sherff, Amer. Journ. Bot. 28: 28. 1941; *Pittosporum Terminalioides sensu* Rock, Indig. Trees Haw. Isls. 159. 1913 (as to Maui plants and the accompanying plate 57).

Leaves often somewhat thinner, blade commonly 7–9 cm. long and 2–3 cm. wide, few or no veins salient, petiole 1–2 cm. long. Peduncle up to 2.8 cm. long, pedicels ±6 mm. long, capsules smaller and somewhat more numerous, their oblong-orbiculate valves commonly under 1.8 cm. long and wide.

Type specimen: Collected by *Joseph F. Rock*, No. 8,669, alt. 1,500 feet, lava fields of Auwahi, District of Kahikinui, southwestern slopes of Haleakala, East Maui, November, 1910 (Bish.).

Distribution: Island of Maui.

Specimens examined: *Joseph F. Rock*, Isl. Maui (Bish.); *Rock*, Auwahi, East Maui, November, 1910 (Gray, 2 sheets); Rock 8,669 (type, Bish.: cotype, N.Y.); *Carl Skottsberg* 791 *pro parte*, Iao Valley, West Maui, October 11, 1922 (Bish.); *Gerrit P. Wilder*, Maui, 1913 (Bish.).

Rock (*loc. cit.*) states that this variety "differs from the Hawaii plants [*i.e.*, the species proper] in the leaves only, which are much thinner texture, being chartaceous and having rather indistinct veins." As noted above, however, the capsules are smaller and somewhat more numerous.

Pittosporum Terminalioides var. ϵ **lanaiense** Sherff, Field Mus. Bot. Ser. 22: 429. 1941.

[1] While Degener 10,993 is clearly the var. *macropus*, its tendency to have 3-valved capsules suggests the large-fruited *P. Hosmeri* and var. *longifolium* of southwestern Hawaii. *P. Hosmeri* and its var. *longifolium* frequently have 3- or even 4-valved capsules, but these are very different from those of var. *macropus*.

To the specimens above cited for var. *macropus* may be added *St. John, Hashimoto, Hosaka, Lindsay, & Mitchell* 11,341, wooded *kipuka*, on *aa* lava, alt. 1,000 feet, Manuka *mauka*, Isl. Hawaii, December 26, 1931 (Bish.; Field). This is a topotype of var. *macropus* and the leaves match closely those of the type. However, a packet enclosed with one of the specimens contains a small, smoothish capsule, minutely puberulent in many areas under the lens. The valves are about 2 cm. long and broad. It is possible that the capsule came from a different species (although in the species proper a similar latitude is observable in the variation of capsular pubescence; thus, for example, the Planchon type, Douglas 20, at Kew has capsules almost glabrate except for a few tiny tomentulose areas, whereas most all other observed specimens have the capsules rather definitely tomentose or tomentulose).

Leaves obovate, blade 6–8 cm. long and 2–4 cm. wide, petiole ±1 cm. long. Peduncle finally up to about 2.6 cm. long, the flowers subsessile. Capsules smaller; valves about 1.5 cm. long and wide, scarcely rugulose, tomentellous, lacking a lengthwise, median furrow.

Type specimen: Collected by *George C. Munro*, No. 333, Paoma, Island of Lanai, April 18, 1914 (Bish.).

Distribution: Known only from type locality in northern Lanai.

Specimens examined: *Munro* 333 (type, Bish.); *Munro* 428, Paoma, April 18, 1914 (Bish.).

The specimens cited had been labeled for *P. Terminalioides* but are apparently quite distinct from the numerous specimens of *P. Terminalioides* examined from the Island of Hawaii. The leaves are proportionately broader and seem consistently small. The capsules are small and lack the shallow, lengthwise, median furrow that usually runs along each valve in the species proper.

10. **Pittosporum kahananum** Sherff, Field Mus. Bot. Ser. 22: 417. 1941.

Loose shrub or spreading tree. Leaves numerous, clustered at and subverticillately below tips of branches, brownish-green when dry, petiole glabrous and 0.8–2 cm. long; blade oblong-obovate, coriaceous, at apex rounded or obtuse, at margin revolute, when nascent densely appressed-hispid, above presently glabrous and impressedly reticulate-veiny, below somewhat conspicuously salient-veiny and finally glabrescent or moderately or even very densely appressed-hispid with white or brown setae, 4–8 cm. long and 1.2–2.5 cm. wide. Inflorescences cauline and axillary, sessile, 1–8-flowered. Only staminate flowers seen. Bracts now ovate now subulate, pubescent or glabrescent, under 4 mm. long. Pedicels tomentose, thick, ±2 mm. long. Sepals subnarrowly or broadly ovate, at apex acuminate or obtuse, moderately appressed-hispid outside, at margin scarious, 3.5–4.5 mm. long. Petals 5 (rarely 6), more often distinct, white, 12–13 mm. long (including expanded terminal portion, this oblong and ±4 mm. long). Stamens slender, ±6.5 mm. long, subequal or even equal to pistil in length. Capsule (a single one seen) ovoid; valves finally flat, at base subcordate-truncate, externally very rugose and sulcate, otherwise more or less glabrous, about 3.5 cm. long and 2–2.3 cm. wide. Seeds intensely lustrous-black, angled and somewhat wrinkled, about 6.5–7 mm. long, 5–5.5 mm. wide, 2.5–3 mm. thick.

U. OF ILL. LIB.

Type specimen: Collected by *Harold Saint John*, No. 10,152, spreading tree, flowers white, alt. 2,400 feet, near the divide, Waikane-Schofield Trail, Kahana, Island of Oahu, January 19, 1930 (Bish.).

Distribution: Known only from type locality in eastern Oahu.

Specimens examined: *F. R. Fosberg* 12,248, loose shrub 1 meter tall, flowers cream-white, odor not pleasant, on steep, wet, exposed, bushy slope, alt. 750 meters, Waikane-Schofield Trail, Kahana, July 27, 1935 (Bish.; Field); *Saint John* 10,152 (type, Bish.).

The leaf-shape and fruit are much the same as in *P. sulcatum*. The leaves are very different, however, in that many of them retain a usually dense coating of innumerable more or less coalesced, white or brown hairs. *P. sulcatum* has glabrous adult leaves and its var. *Remyi* has at the most a very few hairs on the lower leaf-surfaces. *P. cauliflorum* var. *fulvum* is occasionally rather small-leaved and then may superficially resemble *P. kahananum*. That variety can be told at once, however, by the dense tomentum on the younger parts and often on the lower surfaces of the older leaves, also by the tomentose capsules. In *P. kahananum* the hairs are fewer and straighter, justifying the term hispid rather than tomentose, and the capsules are essentially glabrous (though rugose).

11. **Pittosporum cauliflorum** H. Mann, Enum. Haw. Pl. No. 18 (Proc. Amer. Acad. 7: 151). 1867.

a. Leaves with reddish-brown tomentum beneath, capsules finally more or less glabrate.....var. *γ cladanthoides*.

a. Leaves, unless when emerging from the bud, brownish- to yellowish-tomentose beneath.

b. Capsules subsessile.....*P. cauliflorum* sensu stricto.

b. Capsules pedicellate with pedicels at least 5–11 mm. long. var. *β pedicellatum*.

A loosely branched tree, 9 meters or more high, trunk 2–3 dm. thick. Leaves crowded at ends of stout and stiff branchlets, coriaceous, closely areolate and finally glabrous to glabrate above, petiole 1–3 cm. long and when young tomentose; blade obovate to elongate-obovate or cuneate, 8–20 cm. long and 3–7.5 cm. wide, at apex rounded or shortly apiculate, gradually narrowed into petiole, upper surface pale-green, lower surface densely covered with a soft fawn- or pale-lemon-colored tomentum. Fertile flowers apparently somewhat larger than the sterile ones, cauline on the bare branches below the leaves, grouped subsessilely in clusters of 8–12 on tomentose

peduncles 4–8 mm. long. Bracts tomentose, ±5 mm. long. Sepals ovate, obtuse, tomentose, ±3 mm. long. Corolla cream-colored, its tube 8–10 mm. long, the broad, spreading lobes 4–5 mm. long. Stamens ±5 mm. long, reaching to above middle of style, their anthers sagittate. Ovary tomentose, about half as long as style, stigma capitate and 2-lobed. Capsule thick-woody; the flattened valves with a slight median furrow at least above but otherwise subsmoothish or at times somewhat transverse-rugose, about 2.8 cm. long and 2.5 cm. wide, tipped with a stylar beak ±3 mm. long, the tomentum mostly deciduous in age; endocarp pale-orange. Seeds flat-angular, crenulate or tuberculate at the back and edges, 6–7.5 mm. long.

Type specimen: Collected by *Horace Mann & William T. Brigham*, No. 601, Kaala Mts., Island of Oahu, May 4, 1864–May 18, 1865. Type herbarium not cited, but the two specimens at Cornell University, one of them unnamed by Mann, and the named one at Gray Herbarium have as good claims as any to being regarded as the type.

Distribution: Known only from Kaala Mts., Island of Oahu.

Specimens examined: *Mann & Brigham* 601 (type collection: Corn., 2 sheets; Gray; Mo.).

The capsules on the above cited *named* specimens at Cornell University and Gray Herbarium are fewer, larger, less mature, and less rough, offering a striking resemblance to those of *P. glabrum* var. *spathulatum*. The capsules of Mann's unnamed specimens above cited for Cornell University, also those for his similarly unnamed specimen at the Missouri Botanical Garden, are slightly rugose, as sometimes happens on specimens of *P. glabrum* and its var. *spathulatum*. They are, however, not of the strongly rugose or tuberculate type as is common, for example, in *P. sulcatum* or its var. *Remyi*. This fact is most important to note, because nearly all herbarium specimens[1] collected since Mann's time and referred by various workers to *P. cauliflorum* or to varieties of it have the definitely rugose type of capsule and must be separated specifically (see *P. cladanthum* and vars.).

Pittosporum cauliflorum var. β **pedicellatum** Sherff, Amer. Journ. Bot. 28: 20. 1941.

[1] In fact all specimens except those referred below to *P. cauliflorum* var. *pedicellatum* and var. *cladanthoides*.

Tree ±5.5 meters tall, trunk about 1 dm. thick, leaves similar to those of var. *fulvum* (blade now 1.8 cm. long and 7.5 cm. wide now 6–8 cm. long and 3–4.5 cm. wide). Peduncle now 1–1.8 cm. long (for fertile flowers) and tomentose, now (probably for sterile flowers) 4–7 cm. long and very densely appressed-setose or supernally tomentose. Pedicels slender, tomentose, numerous (sometimes 8–15), now (for fertile flowers) 5–11 mm. long now (probably for sterile flowers) 1–2 cm. long. Flowers white, cream-colored at top. Fertile flowers: sepals 2–3 mm. long, corolla's tube 7–9 mm. long and lobes 3–5 mm. long. Capsules tranversely quadrate, about 3 cm. long; valves outwardly smooth (not wrinkled but minutely tomentose), finally flat, in outline quadrate, about 3 cm. wide; beak about 2.5 mm. long. Seeds 6.5–8 mm. long.

Type specimen: Collected by *Harold Saint John*, No. 10,378, one tree, 18 feet tall, trunk 4 inches thick, flowers white, cream at tip, pods square in cross-section, on open hillside, alt. 1,400 feet, on north fork of valley east of Palikea, Waianae Mts., Island of Oahu, February 23, 1930 (Bish.).

Distribution: Waianae Range, Island of Oahu.

Specimens examined: *Joseph F. Rock*, Waianae Mts., Palikea, December 31, 1915 (Bish., 2 sheets); *Saint John* 10,378 (type, Bish.: cotypes, Berl.; Field, 2 sheets).

The type material differs sharply from that of *P. cauliflorum* proper in its well developed pedicels. A remarkable feature, too, is the six elongate peduncles (4–7 cm. long) found on one specimen (in Herb. Field Mus.). These have the hairs of the pubescence more appressed and lengthwise disposed, rather than tomentose. Their pedicels are especially long (1–2 cm.). As all the flowers are missing or insect-eaten, it can only be surmised that they bore staminate or sterile flowers. Future collections of this variety and of the species proper are of course desirable to determine whether this surmise is correct, also what kind of peduncles and pedicels the sterile inflorescence of the species proper has, and to what extent therefore the characters of the sterile inflorescence may be used for separating the var. *pedicellatum* from the species proper. The specimens by Rock have capsules and numerous fertile (*i.e.*, pistillate) flowers.

The leaves have blades up to 2.3 dm. or more long and to ±7.5 cm. wide, and slender petioles 1–3 cm. long. The tomentum of their lower surface is brownish as in many *P. cladanthum* specimens and the veins are moderately conspicuous beneath as in that species

(not strongly incrassate as in its var. *reticulatum*). From *P. cladanthum*, however, the smoothish, not strongly rugose or lumpy, exterior of the capsules should separate sufficiently well. From the next following var. *cladanthoides*, var. *pedicellatum* differs in lacking a strong reddish tinge to its brown leaf-tomentum, and in having larger, more permanently tomentose capsules, the valves of these being square, not obcordate-obovate, in outline, and about 3 cm. not 2.2–2.5 cm. long and wide.

Pittosporum cauliflorum var. γ **cladanthoides** Sherff, Amer. Journ. Bot. 28: 21. 1941.

Probably a tree. Leaves narrowly oblong-obovate, densely clothed with red-brown tomentum beneath, where moderately veiny; apically rounded-obtuse blade +7 cm. petiole ±1.5 cm. long. Fertile inflorescence shortly (about 6–8 mm.) pedunculate, ±5-pedicellate, pedicels ±5–6 mm. long. Capsules 2.2–2.5 cm. long, finally flattish; valves obcordate-obovate or oblong, outwardly not or but very minutely rugose and presently more or less glabrescent, 2.2–2.5 cm. wide, beak about 2 mm. long. Seeds 6–7 mm. long.

Type specimen: Collected by *Erling Christophersen, Gerrit P. Wilder, & Edward P. Hume*, No. 1,577, in wet forest, alt. 500–600 meters, Puu Kapu, Island of Oahu, February 12, 1931 (Bish.). Coulter (J. W., Gazetteer Terr. Haw. 189. 1935) lists two Puu Kapu's for the Island of Oahu, but I assume that the one at 21° 36′ N. and 158° 1′ W., in the Kaipapau Quadrangle of northern Oahu, was the type locality.

Distribution: Island of Oahu.

Specimens examined: *Christophersen, Wilder, & Hume* 1,577 (type, Bish.).

The type is a single branchlet about 2 dm. long, with a lone terminal whorl of five leaves and one cauline, pedunculate cluster of capsules borne about 6.5 cm. beneath these. The leaves happen to be small, but undoubtedly grow much larger at times, as in the species proper.

12. **Pittosporum halophilum** Rock *ex* Sherff, Amer. Journ. Bot. 28: 18. 1941; *Pittosporum halophylum* Rock, College Haw. Publ. Bull. 1: 16, pl. 4. 1911; *Pittosporum litorale* Rock, *loc. cit.* (*non* Merr.).

An erect shrub, about 1 meter tall; branches stout, grayish-black. Leaves densely pubescent on both sides when young, petioled, petiole

more or less flattish and margined, densely tomentulose, 6–10 mm. long; mature blade obovate, at apex obtuse or rounded or even slightly emarginate, at base shortly cuneate-acuminate, coriaceous, glabrate and minutely reticulate-veiny on the pale-green upper surface, densely tomentose with a yellowish- or reddish-brown wool on the obscurely veiny lower surface, 3.5–6.5 cm. long and 2–3.5 cm. wide. Inflorescence cauline or axillary, subsessile or on brown-tomentose peduncle up to 5 (or even 13?) mm. long. Bracts linear-lanceolate, acute, 5–6 mm. long. Sepals ovate or oblong-ovate, acute, densely covered with a brown tomentum, about 5 mm. long.[1] Corolla cream-colored, fragrant, tube about 1 cm. long, the oblong-ovate lobes one third as long. Fertile stamens two-thirds or fully the length of corolla-tube; anthers oblong-linear, about 3 mm. long. Ovary hirsute, style and capitate stigma reaching to top of corolla-tube. Capsule unknown.

Type specimen: Collected by *Rock & Nevin*, No. 6,183, along the beach on the windward side of the island, within the spray of the sea, between Kalawao and Waikolu, Island of Molokai, March 26, 1910 (Bish.).

Distribution: Known only from type locality on northern coast of Molokai.

Specimens examined: *Rock & Nevin* 6,183 (cotype, Bish.).

The slightly revolute leaf-margins, so common in *Pittosporum*, are especially noticeable in this species because of the sharp color-contrast between the brown- or reddish-brown-tomentose lower leaf-surface and the rolled-back pale-green glabrate edges of the upper surface. The inflorescence is described by Rock as "cauline immediately under the leaves." The two inflorescences present on the cotype examined are, however, well up among the leaves and are what most authors would term axillary. These are very short-pedunculate, but lower down are several old, barren, twig-like branchlets that may well have been peduncles of a previous year. These are suberect and about 10–13 mm. long. The species, in the words of Rock, "is exceedingly interesting as it represents the only litoral species from the [Hawaiian] islands."

Rock originally, in his herbarium determination, named the type material of this species *Pittosporum halophilum*. This was, of course, an appropriate name, in view of the fact that the type (see above)

[1] Rock describes the tomentum as yellow or yellowish ("flavido") but in the dried cotype specimen before me it is the same color as I have treated throughout as brown.

had grown "within the spray of the sea." The trivial name was unaccountably altered to the meaningless or at least misleading spelling, *halophylum*, when published. In the interests of orthographic accuracy, it has recently been corrected to *P. halophilum* (Amer. Journ. Bot. 28: 18. 1941).

13. **Pittosporum cladanthum** Sherff, Amer. Journ. Bot. 28: 21. 1941; *Pittosporum cauliflorum* var. *fulvum* Hillebr. Fl. Haw. Isls. 25. 1888; *Pittosporum cauliflorum* var. *macrophyllum* Skottsb. Meddel. Göteb. Bot. Trädgård 10: 109. 1936.

a. Leaf-blades mostly 1.2–2.3 dm. long, their veins moderately salient and delicate beneath; native of Oahu.
P. cladanthum sensu stricto.

a. Leaf-blades mostly 0.6–1.4 dm. long.

b. Their veins somewhat incrassate and conspicuously salient beneath; seeds 6.5–7.5 mm. long; native of Oahu.
var. γ *reticulatum*.

b. Their veins delicate and moderately salient beneath; seeds 5–6 mm. long; native of Lanai.....var. β *gracilipes*.

A tree 3–6 or sometimes even 9 meters tall. Leaves narrowly to subbroadly obovate, often very large, blade up to 2.5 dm. long and 9 cm. wide, petiole up to 5.5 cm. long, lower surface salient-veiny and more or less reddish- or more often brownish-tomentose; young shoots conspicuously and densely brownish- or reddish-tomentose throughout. In floral characters apparently similar to *P. cauliflorum* but the fruiting peduncles often 1–4 cm. long and sometimes finally 7 mm. thick. Capsules rugose or rough-tuberculate but less so than in var. *reticulatum*, the mature valves flattening to an obovate or barely ovate or oblong shape, 2–2.7 cm. long exclusive of short stylar beak and 2.1–2.6 cm. wide, pedicels mostly 2–8 mm. long; seeds smoothish, 7–9 mm. long.

Type specimen: Since the name *P. cladanthum* was founded directly on the material commonly referred to *P. cauliflorum* var. *fulvum* Hillebr., the types might reasonably be expected to be the same. The type of *P. cauliflorum* var. *fulvum* was collected by *William Hillebrand* on Oahu (Berl.). It is at present inaccessible for study. Hillebrand gave the distributional range as "Ewa to Waialua." His specimen No. 302 at Kew came from Waiawa Valley of the Koolau Range, Oahu. This lacks fruits, but in leaves is typical for the many rough-fruited specimens that pass in herbaria for var. *fulvum* Hillebr. or its synonym, var. *macrophyllum* Skottsb.

Hillebrand, however, had seen no fruits of his var. *fulvum* anyway, as he stated in his text. It is conceivable that his Waiawa Valley specimen, which had been collected many years before the publication of his var. *fulvum*[1] was actually of the smoother-fruited form collected by *Christophersen, Wilder, & Hume*, No. 1,577, at Puu Kapu, and referred by me to the very rare *P. cauliflorum* var. *cladanthoides* (*qu. v.*). There is no doubt, however, that when Hillebrand gave the comprehensive range "Ewa to Waialua" for his var. *fulvum* he referred principally to the common form having rough or lumpy fruits, these often somewhat ridged or shallowly crested lengthwise along the median line of each valve. But because of the technical even though slight uncertainty that must always attach to the precise type basis of the var. *fulvum*, I have chosen to describe *P. cladanthum* anew upon its own independent type basis. The specimen selected as the type is *Degener, Park, Potter, Bush, & Topping* 10,986, in rain-forest, Malaekahana Trail, Laie, Island of Oahu, July 29, 1935 (Field, 2 sheets).

Distribution: Island of Oahu.

Specimens examined: *Edwin H. Bryan, Jr.*, Aiea, June 5, 1920 (Field); *Bryan*, alt. 1,200 feet, lower west ridge, Kaipapau Valley, July 11, 1920 (Bish.; Field); *Bryan*, trees, 3–4 meters tall, at lower edge of lower forest at transition with guava-lantana vegetation, Hauula Forest Reserve, Punaiki Trail, behind Hauula, May, 1933 (Field); *Erling Christophersen* 1,384, tree, 5–6 meters tall, in forest, alt. ±200 meters, Pupukea-Kahuku Trail, Koolau Range, August 12, 1930 (Bish.; Field); *Otto Degener* 13,002, in forest, Oio-Paumalu Trail, June 16, 1940 (Deg.; Field); *Degener* 13,003, in forest, Waipilopilo, Hauula, June 11, 1940 (Berl.; Deg.; Field, 2 sheets); *Degener & Gordon Dowson* 12,926, among bushes, Papali Gulch, Hauula, September 8, 1940 (Berl.; Deg.; Field); *Degener & Emilio Ordoñez* 12,204, in open forest, Waimea Valley, July 24, 1938 (Deg.; Field, 2 sheets); *Degener & Ordoñez* 12,576, flower-buds observed several nodes below ripe fruit, in lower forest, Pupukea-Kahuku, December 14, 1939 (Field); *Degener, Ordoñez, & John Foster* 12,297, in lower rain-forest, north rim of Kaluanui Valley, March 18, 1939 (Berl.; Field, 2 sheets; also a score or more additional, unmounted sprays, as yet undistributed; some typical, some approaching *P. sulcatum* as to smaller leaves, these finally glabrate); *Degener & Kwan Kee Park* 10,985, in forest, east ridge of Kaipapau Valley, July 7, 1935

[1] A separate label at Kew states that the plant was received at Kew in July, 1865.

(Berl.; Deg.; Field); *Degener & Park* 10,997, in forest, Aiea Ridge, September 4, 1932 (Field, 2 sheets); *Degener & Park* 11,000, on dry, exposed slope, southeast side of Makua Valley near its head, January 3, 1935 (Berl.; Deg.; Field); *Degener, Park, & Manuel Kwon* 11,002, in forest, Pupukea-Kahuku region, January 24, 1932 (Deg.; Field); *Degener, Park, Potter, Bush, & Topping* 10,806, in forest, Malaekahana Trail, Laie, July 29, 1935 (Deg.); *iidem* 10,986 (type, Field, 2 sheets: cotype, Deg.); *Degener, Park, Potter, & Gordon Shigeura* 10,809, in forest, Waimalu Gulch, November 3, 1935 (Deg.; N.Y.); *Degener, Topping, Martinez, & Salucop* 11,137, Puulupe Trail, Kawailoa, February 25, 1937 (Berl.; Deg.; Field, 3 sheets; Gray; Kew); *Charles N. Forbes,* Makaha Valley, Koolau Range, February 12–19, 1909 (Mo.); *Forbes* (*with Dean Lake*) 1,993-*O,* Waimano Valley, October 27–30, 1914 (Bish.; Mo.); *Forbes* 2,053-*O,* on ridge north of Waimea Valley, February 10–13, 1915 (Bish.); *F. R. Fosberg* 9,439, bush, 3 meters tall, in moist forest, alt. 400 meters, Laie-Malaekahana Ridge, Koolau Mts., April 15, 1933 (Berl.; Bish.; Field, 2 sheets); *Fosberg* 10,357, bush, 3 meters tall, in dry forest, alt. 350 meters, on ridge "southeast Makua Gulch," Koolau Mts., Hauula, October 15, 1933 (Bish.; Field, 2 sheets); *Fosberg* 12,360, tree, 5 meters tall, alt. 500 meters, on dry, wooded ridge, south side of Makua Valley, Waianae Mts., November 17, 1935 (Field); *Edward Y. Hosaka* 113, in woods, alt. 1,800 feet, Pupukea, Paumalu Forest Reserve, Koolau Mts., January 12, 1930 (Bish.); *Hosaka* 770, tree, 20 feet tall, in moderately dry place, alt. 700 feet, 2nd north fork, Kipapa Gulch, Koolau Range, September 25, 1932 (Field); *Hosaka* 979, tree, 30 feet tall, in lower wooded forest, alt. 1,000 feet, Kipapa Gulch, April 30, 1933 (Field); *Edward P. Hume* 82, alt. 425 meters, Kipapa, February 15, 1931 (Bish.); *Hume* 451, tree, on sparsely wooded slope, alt. 1,000 feet, Kalauao Gulch, Aiea, Koolau Range, January 3, 1932 (Field); *Charles S. Judd* 19, erect tree, 3 meters tall, alt. 225 meters, dry gulch side, Pupukea, September 28, 1925 (Bish.; *pro var. nova a F. Brownio acceptum*); *Judd* 69, Hawaiian Islands, 1928 (Bish.); *Noel Krauss,* alt. 400–600 feet, Waipilopilo Gulch, Hauula, December 2, 1933 (Field); *Alfred Meebold,* alt. 3,000 feet, Makaleha Ridge, Kaala, Waianae Mts., June, 1932 (Bish.); *Meebold,* Waiahole ditch trail, June, 1932 (Bish.); *Meebold* (*Otto Degener distrib. No.*) 10,800, Paumalu, November, 1935 (Deg.); *Richard Onouye,* small tree, about 18 feet tall, in rain-forest, alt. 1,800 feet, on Maakua-Papali Ridge, Kaipapau Forest Reserve, Hauula, October 15, 1933 (Bish.); *Rock & Swezey* 4,813, Valley of Niu, August 22, 1909 (Arn.); *Harold Saint John* 10,140, flowers

white, sweetly fragrant, on wooded ridge, alt. 1,100 feet, Pupukea-Paumalu Forest Reserve, January 12, 1930 (Field); *Carl Skottsberg* 1,792, in Pupukea Forest Reserve, Pupukea-Malaekahana Trail, September 15, 1926 (type, Bish., and cotype, Goth., of *P. cauliflorum* var. *macrophyllum* Skottsb.); *Otto H. Swezey*, Ewa, January, 1913 (Gray); *David L. Topping* 2,925, along Pupukea-Kahuku Trail, November 23, 1924 (Deg.); *E. K. Yoshinaga*, Pupukea, January 12, 1930 (Bish.); *T. G. Yuncker* 3,018, on ridge trail back of Aiea, September 4, 1932 (Yuncker).

As *Pittosporum cladanthum* represents a segregation of several formerly so-called varieties of *P. cauliflorum* from that species, it may be well to review here briefly the historical setting of those varieties. Hillebrand (Fl. Haw. Isls. 25. 1888) described three varieties of *P. cauliflorum*, namely, var. β *fulvum*, var. γ (without name), and var. δ *flocculosum*, in the order here given. Var. *fulvum*, described as extending in range from Ewa to Waialua, Oahu, is represented by Hillebrand 302, from Waiawa Valley of the Koolau Range, Oahu, a specimen at Kew (as well, doubtless, as one or more specimens at Berlin, but which I have not as yet examined). This lacks flowers and fruits. The leaf-blades are broadly oblanceolate and range to about 10.5 cm. long and 4 cm. wide. The petioles are 1.5 to 2.5 cm. long. The under surfaces of the leaves are densely covered with a reddish-brown tomentum except in a few small areas where this has sloughed off. The principal lateral veins are moderately visible beneath through the tomentum. An examination of a wide range of specimens from Oahu shows that *P. cauliflorum* var. *macrophyllum* Skottsb. is to be referred here. The var. *macrophyllum* had large leaves, excessively dense, brown or reddish-brown tomentum that covered the young leaves and their subtending branchlets, also tomentose, rough, subpedicellate capsules clustered mostly in threes on a peduncle about 1 cm. long. It evidently had been segregated by Skottsberg as a variety because of its large leaves, but the leaf-size varies too much to permit of separation from var. *fulvum*.[1]

Recently (*cf.* Amer. Journ. Bot. 28: 21. 1941; also see above under *P. cauliflorum*, p. 521), on finding that this var. *fulvum* was to be elevated to separate specific rank because of its rugose fruits, I renamed it *Pittosporum cladanthum* (*qu. v.*).

[1] Described by Hillebrand without special mention of leaf-size and thus assumedly similar in this respect to the species proper, with leaves described by Hillebrand as "6–8 inches × 2–3 inches." It is significant that for Hillebrand's var. γ, a form with usually smaller leaves, he did not omit the leaf-size, describing it as "4–6 inches × 2–2½ inches."

Var. γ was cited first from Mt. Kaala, Oahu. The leaves were said by Hillebrand to be "brownish-tomentose as in var. β, but strongly nerved underneath." Hillebrand had seen no capsules for his var. *fulvum* and it seems that he likewise had seen none for his var. γ. For each he gave a few supplementary characters but these appear to have been drawn from inflorescences of different sexes and perhaps different stages of maturity. However, Skottsberg (Meddel. Göteb. Bot. Trädgård 10: 109. 1936) has accepted Hillebrand's var. γ and named it *reticulatum;* this is the *P. cladanthum* var. *reticulatum* of my treatment below. Like "var. *fulvum,*" var. *reticulatum* has the young leaves and their subtending branchlets densely brownish- or reddish-brown-tomentose, these thus presenting a strong contrast to the lower, older, and larger leaves, which are green and glabrous or glabrate on their upper surfaces. Var. *reticulatum* simulates strongly *P. confertiflorum* var. *Mannii,* from which it seems consistently to differ, however, in lacking a terminal inflorescence.

Var. δ *flocculosum* was based on material from Kaala, Oahu, and is easily recognized by the "pale strigose pubescence in flakes or patches" on the lower surfaces of the leaves. A comparison of this strigose pubescence with the tomentum on the leaves of *P. cauliflorum* indicates that the two forms are specifically distinct (see *P. flocculosum*).

Pittosporum cladanthum var. β **gracilipes** Sherff, Field Mus. Bot. Ser. 22: 427. 1941.

Similar in size of the thin, obovate or spatulate-obovate leaves to var. *reticulatum* but in their veins and pubescence to *P. cladanthum* proper; blade 6–12 cm. long and 2.5–5 cm. wide. Flowers (many pistillate ones seen) short, sessile, in a slenderly pedunculate inflorescence, peduncle 1–1.7 cm. long and at first scarcely 1 (but finally ±4) mm. thick; sepals acute; corolla only about 6–7 mm. long including the terminal portion (this dilated, subrotund, ±2.5 mm. long) of the separate petals. Capsule (a single mature one seen) moderately rugose, densely tomentulose, about 2 cm. long (beak excluded) and scarcely 1.8 cm. wide; seeds about 5–6 mm. long.

Type specimen: Collected by *Charles N. Forbes,* No. 380-*L,* on Island of Lanai, September, 1917 (Bish.).

Distribution: Island of Lanai.

Specimens examined: *Forbes* 380-*L* (type, Bish.: cotypes, Berl.; Field).

In Hillebrand's highly generalized key (Fl. Haw. Isls. 22. 1888) the type collection would run to *P. Terminalioides* and it may be remarked that Hillebrand (p. 24) thought of that species as occurring partly on Lanai. However, the foliar habit, particularly as to the densely velvety-fuzzy young leaves, seems to suggest closer affinities with *P. cladanthum.*

Pittosporum cladanthum var. γ **reticulatum** (Skottsb.) Sherff, Amer. Journ. Bot. 28: 23. 1941; *Pittosporum cauliflorum* var. γ Hillebr. Fl. Haw. Isls. 25. 1888; *Pittosporum cauliflorum* var. *reticulatum* Skottsb. Meddel. Göteb. Bot. Trädg. 10: 109. 1936.

Leaves narrowly obovate to oblong-obovate, blade commonly 8–15 cm. long and 2.5–6 cm. wide, apically subrotund to abruptly short-acuminate, strongly areolate above, salient-venose and conspicuously brownish- or reddish-brown-tomentose beneath, petiole usually 1.5–2.5 cm. long. Capsule 2–2.5 cm. long, densely short-tomentose or finally glabrate, transversely more or less waved and grooved but not sharply ridged, subsessile or on pedicel up to 7 mm. long, more or less obovate when flattened out in age. Seeds 7–9 mm. long, smoothish.

Type specimen: Collected by *William Hillebrand,* on Mt. Kaala, Island of Oahu (Berl.).

Distribution: Island of Oahu.

Specimens examined: *H. F. Bergman,* in moist woods, alt. 3,100 feet, north side of Kaala, February 11, 1928 (Berl.; Bish.; Field); *Erling Christophersen, Gerrit P. Wilder, and Edward P. Hume* 1,511, in forest, alt. 450–600 meters, Kuliouou, February 5, 1931 (Berl.; Bish.; Field; Par.); *Otto Degener* 13,007, in forest, on summit ridge between Puu Kanehoa and Puu Kaua, June 23, 1940 (Berl.; Deg.; Field); *Degener, Ordoñez, & Foster* 12,333, on cloudy summit, Puu Hapapa, May 7, 1939 (Field); *iidem* 12,359, in shrubby forest near top, southeast slope of Puu Hapapa, June 4, 1939 (Berl.; Deg.; Field); *Degener, Ordoñez, & Kepaa* 12,737, fruit about 2 feet below branch tip and rarely at tip,[1] on forested slope at summit, northeast ridge of Puu Kanehoa, March 31, 1940 (Berl.; Deg.; Field); *iidem* 12,811, same locality, near top of ridge, April 14, 1940 (Berl.; Deg.; Field; a rather puzzling form with foliage of var. *reticulatum* but with a few capsules in age much smoother as in var. *fulvoides*); *Degener, Park, Shigeura, & Takamoto* 10,807, in summit-forest, between Palehua and Palikea, December 16, 1935 (Berl.; Deg.;

[1] On separate slip, Mr. Degener writes: "I would not be surprised if fruit is merely ±terminal due to bud injury."

Field); *Degener, Park, & Topping* 10,808, near summit-ridge, Kuliouou Valley, June 23, 1935 (Deg.; Field); *Charles N. Forbes*, Kaala Mts., Makaha Valley, February 12–19, 1909 (Bish.; Field); *F. R. Fosberg* 10,970, tree, 5 meters tall, on wet, wooded ridge, alt. 800 meters, above Kupehau, Waianae Mts., Honouliuli, June 30, 1935 (Field); *Alfred Meebold (Otto Degener distrib. No.)* 10,804, Paumalu, October, 1935 (Deg.); *Meebold (Degener distrib. No.)* 10,805, Makaleha Valley, December, 1935 (Deg.; N.Y.); *Joseph F. Rock* 170 *pro parte*, Punaluu Mts., December 3–14, 1908 (Bish.; leaves smaller, blades 6–9 cm. long and mostly 2.5–3.3 cm. wide); *Rock & Agee* 17,027, Waiawa Gulch, December, 1919 (Arn.); *Harold Saint John* 12,198, shrubs, 15 feet tall, in thickets, alt. 2,800 feet, on upper ridges, Puu Kaua, Waianae Mts., November 6, 1932 (Field); *Carl Skottsberg* 272, alt. about 600 meters, Palehua, Waianae, August 23, 1922 (Goth.); *Otto H. Swezey*, Waiahole, September, 1916 (Bish.).

Hillebrand (Fl. Haw. Isls. 25. 1888) cited both Oahu and Kauai for this variety, the latter island on the strength of Gray's cited locality for Gray's *Pittosporum Terminalioides* var. β (Bot. U. S. Explor. Exped. 231. 1854), which Hillebrand considered synonymous. The type of *P. Terminalioides* var. β Gray is still extant (U.S. Nat. Herb.). It has leaves broadly oblanceolate, definitely acuminate, blades 10–18 cm. long, petioles ±1.5 cm. long. It lacks flowers and fruits. It seems closer to *P. cladanthum* var. *reticulatum* than to the allied species *P. Gayanum*, but with the materials at present accessible cannot be positively referred to either.

Skottsberg (*loc. cit.*), while citing his No. 272 as a specimen, nevertheless published the name *reticulatum* definitely as a *nomen novum* for Hillebrand's var. γ of *P. cauliflorum* Mann.

14. **Pittosporum Gayanum** Rock, Indig. Trees Haw. Isls. 166, pl. 61. 1913.

Leaves when young covered on both surfaces with dark-brown or reddish-brown tomentum, in age remaining more or less tomentose beneath ..... *P. Gayanum* sensu stricto.

Leaves entirely glabrous even when young ..... var. β *waialealae.*

Small tree or tall shrub, 4.5–5.5 meters tall, with round, spreading crown or, when growing on the high central plateau near Waialeale in the dense rain-forest, a tree with very few straight, ascending branches. Leaves crowded at ends of branches or scattered, obovate-oblong or less often a few obovate, shortly acuminate at apex, more or less revolute at margins, conspicuously reticulate with veins

depressed above and salient beneath, when young covered on both surfaces with dark-brown or reddish-brown tomentum, at maturity becoming glabrous or glabrate above but only in irregular patches so beneath, the blades mostly 1–2.5 dm. long and 4–10 cm. wide, the petioles somewhat margined and about 1.5–2.5 cm. long. Inflorescence axillary and cauline, peduncle short, ±1.2 cm. long, with dark-reddish-brown tomentum, bracteate with tomentose and linear- or lanceolate-subulate bracts; pedicels 5–10 mm. long, flowers fragrant; sepals 3 mm. long; corolla cream-colored, its tube about 1 cm. and lobes about 4 mm. long; stamens equaling corolla-tube, anthers oblong; ovary tomentose, one-third as long as the exserted style; capsule ovoid to cordiform, pointed, densely covered with dark-reddish-brown tomentum, about 2 cm. or more in diameter, the valves rugose and scrobiculate; seeds angular, shining-black, smooth, about 5 mm. long.

Type specimen: Collected by *Joseph F. Rock*, No. 8,867, on the high plateau of Kauai, October, 1911 (Bish.).

Distribution: Island of Kauai. Rock (*loc. cit.*) writes: "This very interesting tree is peculiar to the interior, high plateau of Kauai, especially the upper slopes of Waialeale. It grows in the swamps and swampy forests as well as along streambeds several miles inland from Kaholuamano [Kaholuamanu], at an elevation of 4,800 to 5,000 feet. It is not uncommon in the more open flat swamps in company with the thousands of *Lobelia macrostachys* at this region, which is constantly wrapped in clouds . . . . It is a constant species and grows all over the summit of Kauai."

Specimens examined: *Lucy M. Cranwell & Carl Skottsberg* 2,868*b*, Kilohana, Alakai, August 16, 1938 (Goth.); *Cranwell, Olof H. Selling, & Skottsberg* 3,727, Kawaia Trail, Kohua Ridge, region below Alakai, August 19, 1938 (Goth.); *Otto Degener* 10,995, in open place, Waineke Swamp, June 28, 1926 (Field); *Degener* 10,996, in forest, same locality, July 1, 1926 (Berl.; Field); *Charles N. Forbes* 258-*K*, Wahiawa Mts., August, 1909 (Berl.; Bish.; Field); *Forbes* 919-*K*, Waimea Drainage Basin, west side, July 3–August 18, 1917 (Bish.); *F. R. Fosberg* 12,677, shrub, 5 meters tall, flowers white and fragrant, alt. 1,250 meters, in wet forest, plateau at head of Kalalau Valley, December 29, 1935 (Field, 2 sheets); *Albert S. Hitchcock* 15,497, alt. 3,600–5,080 feet, Waialeale, October 22–24, 1916 (U.S.); *Joseph F. Rock* 18 (5,481), small tree or shrub, high plateau, September 24, 1909 (Bish.; Field); *Rock* 18 (6,072), trail to Alakai Swamp, October 14, 1909 (Field); *Rock* 18 (6,074), a small tree on rather exposed

places, alt. 4,500 feet, same place and date (Berl.); *Rock* 18 (6,078), on trail to Alakai Swamp, October 14, 1909 (Field); *Rock* 6,071, Alakai Swamp, October, 1909 (N.Y.); *Rock* 8,867 (Gray, 2 cotype sheets); *Rock* 17,282, Isl. Kauai (Bish.); *Saint John, Hosaka, Hume et alii* 10,764, alt. 3,500–4,023 feet, northwest end of Alakai Swamp, December 27, 1930 (Bish.; Field); *Olof H. Selling* 2,868, Kilohana, Alakai, August 13, 1938 (Goth.); *Skottsberg* 979, between Kokee and Kilohana, October 27, 1922 (Goth.).

Pittosporum Gayanum var. β **waialealae** Rock, *loc. cit.*

Leaves whorled at ends of branches, glabrous even when young, blade only 5–10 cm. long and 2–3.5 cm. wide, petiole about 1 cm. long. Peduncle sparsely and pedicels subsparsely hispidulous at least in young-fruiting stage; capsules brown-tomentose when young, deeply scrobiculate but glabrous when mature, 2 cm. in each direction.

Type specimen: Collected by *Joseph F. Rock*, No. 8,866, a shrub 5 feet tall, in the open bog, alt. 5,200 feet, at the very summit of Waialeale, Island of Kauai, October 20, 1911 (Bish.).[1]

Distribution: Known only from type locality on the Island of Kauai.

Specimens examined: *Rock* 8,866 (cotypes, Arn.; Gray).

15. **Pittosporum flocculosum** (Hillebr.) Sherff, Amer. Journ. Bot. 28: 23. 1941; *Pittosporum cauliflorum* var. *flocculosum* Hillebr. Fl. Haw. Isls. 25. 1888.

A bush or small tree, up to ±10.5 meters tall. Leaves mostly clustered at ends of branches, obovate-oblong, obtuse to somewhat acuminate, thin, smooth and scarcely areolate on upper surface, irregularly clothed on the somewhat saliently venose lower surface, unless in age, with pale, strigose pubescence, this commonly in flakes or patches; blade 1–2.5 dm. long and 4–9.5 cm. wide. Flowers of both sexes axillary or cauline, subsessile and crowded in close heads at ends of peduncles. Bracts 5–6 mm. long. Sepals ovate-obtuse, tomentose, ±3 mm. long. Corolla white, its tube 10–12 mm. long in the sterile and about 8 mm. long in the fertile flowers. Ovary thickly tomentose. Entire fruiting inflorescence (including fruits) highly variable. Capsules now solitary, now 2–8 in a cluster, finally compressed, in outline ovate to oblong or obovate,

[1] Rock's text says, "Oct. 10, 1911" but his type label at Bishop Museum (*fide* Miss Marie Neal) and his cotype label at Gray Herbarium give October 20, 1911 as the date.

now erugose or merely papillate, now coarsely rugose; valves 1.5–3.4 cm. long and wide, when rugose sometimes reinforced on outer face with a prominent lengthwise more or less interrupted rib or crest, persistently tomentose or becoming mostly glabrate. Peduncles mostly glabrous, short (1–2 cm.) and thick or elongate (up to 6.5 cm.) and slender; pedicels from thick and ±3 mm. long to slender and up to 2 cm. long, glabrate. Seeds rather thin and flattish, smooth on faces, smooth or smoothish on edges, 6.5–8 mm. long.

Type specimen: Collected by *William Hillebrand,* on Kaala, Island of Oahu (Berl.).

Distribution: Island of Oahu, also apparently in southeastern Kauai, where represented only by the fruiting specimens (*Faurie* 8) collected at Koloa.

Specimens examined: Oahu.—*Otto Degener, Noel Krauss, & Martin Martinez* 11,019, in forest, Puu Kaupakuhale, October 22, 1936 (Berl.; Deg.; Field, 3 sheets); *Degener, Martinez, & Felix C. Salucop* 11,125, in lower rain-forest, on ridge directly north of Kaala, March 26, 1937 (Berl.; Deg.; Field); *Degener & Emilio Ordoñez* 12,203, slender tree, 35 feet tall, with few horizontal branches, in dark forest, Kaaawa Gulch (north of Kaala), August 2, 1938 (Berl.; Deg.; Field); *Degener, Ordoñez, & John Foster* 12,338, in forest, mauka[1] of Kawaiiki ditch intake, April 30, 1939 (Field, 2 sheets); *Degener, Ordoñez, & Richard Northwood* 12,296, in decadent forest, between Puu Pane and Maili, March 25, 1939 (Field); *Degener, Park, Topping, Bush, & Northwood* 10,999, in forest, gulch north of middle of ridge between Puu Kamaohanui and Puu Pane, January 10, 1932 (Deg.; Field, 2 sheets); *Charles N. Forbes,* Makaha Valley, Koolau Range, February 12–19, 1909 (Bish.; Field); *Forbes* 1,825-*O,* on slopes of Kaala, Mokuleia, April 26–May 16, 1912 (Berl.; Bish.; Field; Mo., 2 sheets); *Forbes (with J. C. Bridwell)* 2,462-*O,* on ridge between Niu and Wailupe, April 11, 1917 (Bish.); *F. R. Fosberg & Miss K. Duker* 9,043, bush, 3 meters tall, in dry forest, alt. 500 meters, head of Makua Valley, Makua, Waianae Mts., November 25, 1932 (Field, 2 sheets); *Frank Kitamura,* tree on dry ridge, alt. 2,600 feet, Puu Hapapa, Waianae Mts., January 7, 1934 (Field); *Donald D. Mitchell,* Puu Hapapa, Waianae Mts., October 19, 1930 (Field); *Joseph F. Rock* 17,003, Makaleha Valley, May 2, 1918 (Arn.; Bish.); *Harold Saint John* 14,003, diffuse tree, 20 feet tall, flowers white, near edge of woods, alt. 2,600 feet, main divide northwest of Puu Kanehoa, Waianae Mts., Honouliuli, January 7, 1934 (Bish.; Field).

[1] *Mauka,* a native Hawaiian term signifying "inland; towards the mountains" (J. W. Coulter, Gazetteer Terr. Haw. 207. 1935).

Kauai.—*Abbé Urbain Faurie* 8, Koloa, December, 1909 (Arn.; Del., 3 sheets; with leaves and mature fruits but without flowers, hence the determination, in the absence of other Kauai material, somewhat uncertain and unsatisfactory).

This species was treated by Hillebrand as a variety of *P. cauliflorum*, but the strigose rather than tomentose pubescence of the lower leaf-surfaces and the glabrous or nearly glabrous fruiting peduncles should separate it specifically from *P. cauliflorum* and varieties. The range of variation in *P. flocculosum* is almost incredible. Without a liberal representation of specimens, one might well mistake two or three extremes of foliage and fruit as connoting distinct varieties or even distinct species. Thus, for example, some specimens have all fruits small, smoothish, and perhaps slender-pedicelled, while some have all fruits large, very rugose or lumpy and ridged, and subsessile. Yet in some cases both types of fruit may occur in the same cluster. In *Degener, Krauss, & Martinez* 11,019, of which I have been permitted through Mr. Degener's generosity to study his entire collection of perhaps thirty specimens, several of the extremes in diagnostic characters are present.

16. **Pittosporum argentifolium** Sherff, Field Mus. Bot. Ser. 22: 424. 1941.

a. Capsules notably rugose or tuberculate; pedicels 3–6 mm. long. var. *β Rockii*.

a. Capsules smoothish (except for pubescence).

b. Pedicels 3–6 mm. long; lower peduncles 1–2 cm. long. *P. argentifolium* sensu stricto.

b. Pedicels lacking or rarely to 3 mm. long; lower peduncles usually under 5 mm. long.....var. *γ sessile*.

Probably a small tree. Leaves disposed subverticillately at and near the tips of the branches, oblong-obovate or -spatulate, somewhat thickish, at apex weakly acuminate, at base narrowed into a slender petiole about 2–3 cm. long, at first (at least on lower face) very densely strigose-tomentose (with brown or silvery hairs), finally on upper surface glabrate and impressed-veiny but on lower surface very densely strigose-tomentose or scurfy-strigose (hairs silvery-white and often partly transformed into a very thin integument) or for a very small part glabrate, blade 1–2.5 dm. long and 3–7 cm. wide. Inflorescences rarely terminal, commonly axillary or variously disposed along branches, tomentose; upper ones sessile, many- (±20-) flowered, axis up to about 1.5 cm. long; lower ones

few- (±10-) flowered, pedunculate, the peduncle 1–2 cm. long. Pedicels 3–6 mm. long; bracts linear-subulate, about 7–8 mm. long. Sepals ovate, brown- or yellow-tomentose, ±4 mm. long. Corolla-tube ±6 mm. long. Capsule obcompressed, in outline horizontally oblong, ±2 cm. long and ±2.6 cm. wide; valves externally not or scarcely dorso-depressed, very minutely tomentellous, slightly rugulose (thus strongly similar to the valves of *P. glabrum* var. *spathulatum*).

Type specimen: Collected by *Joseph F. Rock*, No. 8,656, Auahi (Auwahi), East Maui, November, 1910 (Arn.).

Distribution: East Maui.

Specimens examined: *William Hillebrand* 304, Mt. Haleakala (Kew); *Rock* 8,656 (type, Arn.: cotypes, Arn.; Berl.; Bish.; Field, 2 sheets; Gray).

This is undoubtedly the same plant as that "collected by Lydgate on the south side of Haleakala" and cited by Hillebrand (Fl. Haw. Isls. 27. 1888) for his "β var.? *argenteum*" which he placed under his new *Pittosporum hawaiiense*, described from the forests of Kona and Kohala of the Island of Hawaii. *P. hawaiiense* was the tenth and last species of *Pittosporum* in Hillebrand's text. His ninth species was *P. confertiflorum* Gray, to which this is closer in most respects. In fact, Rock had labeled his collection of No. 8,656 (*i.e.*, the type collection of *P. argentifolium*), *P. confertiflorum* (on label of type in Arn.). Hillebrand, long previous to writing his Flora of the Hawaiian Islands (and at least prior to July, 1865), had likewise labeled his own No. 304 as *P. confertiflorum*.[1] From *P. confertiflorum*, *P. argentifolium* differs at once in its mostly larger leaves and in having the young shoots not conspicuously tawny- or brown-tomentose, but, instead, rather moderately whitish-strigose. The pedicels of *P. argentifolium* are 3–6 not 6–12 mm. long, and the leaves in age have underneath a thinner investiture of pubescence. This consists of hairs that are less curved, more appressed, and at times passing more or less into a membranous scurf that in places may eventually slough away.

Pittosporum argentifolium var. β **Rockii** Sherff, Field Mus. Bot. Ser. 22: 427. 1941.

[1] That Hillebrand failed to mention his own No. 304 in publishing the name *argenteum* may be explained by the fact that his plant had been sent to the Hooker Herbarium (where it was received in July, 1865, and later accessioned in the Kew Herbarium) and was therefore not on hand.

Differs from the species proper: Capsules coarsely tuberculate or rugose, in outline ovate or cordate-ovate, ±2.3 cm. long and ±2 cm. wide.

Type specimen: Collected by *Joseph F. Rock*, No. 8,610, Ukulele, East Maui, October, 1910 (Arn.).

Distribution: Known definitely only from East Maui.

Specimens examined: *Charles N. Forbes*, mountains above Ukulele (Bish.); *Forbes* 192-*M*, in woods near Ukulele, above Olinda, July, 1910 (Bish.); *Rock*, Haleakala, above Ukulele, September, 1910 (Gray); *Rock* 8,610 (type, Arn.: cotypes, Arn.; Berl.; Bish.; Del.; Field, 2 sheets; N.Y.); *Gerrit P. Wilder*, Maui, 1913 (Bish.).

Rock, for whom this variety was named, had labeled one of his specimens (Herb. Gray) *P. confertiflorum*, a species to which he had referred also, as above seen, specimens of *P. argentifolium* proper. In his Indigenous Trees of the Hawaiian Islands (p. 161. 1913) he states: "The capsules of *P. confertiflorum* from the various localities have all possible shapes and forms, but can not be separated successfully into varieties. It will have to remain a polymorphous species." The specimens of *P. argentifolium* proper all were collected, so far as definitely known, at or near Auwahi, near the west end of the southern slope of Mt. Haleakala, in East Maui. Their capsules are of the smoothish (*i.e.*, not rugose or strongly tuberculate) type such as is found in *P. glabrum* and its var. *spathulatum*. The specimens here segregated as var. *Rockii* came from the other side of the same mountain, at the junction of the northeast and northwest slopes. These have capsules of the rugose or strongly tuberculate type such as is found in *P. sulcatum*. Moreover, the capsules are ovate or cordate-ovate in outline, not, as in the species proper, transversely oblong. It seems that the two sets of plants are varietally different, regardless of whatever polymorphism may be proved to exist among the capsules of true *P. confertiflorum*.[1]

Pittosporum argentifolium var. γ **sessile** Sherff, Field Mus. Bot. Ser. 22: 426. 1941.

Leaves often a little smaller, pubescence of lower surface more scurfy and even similar to a cuticle. Flowers not or very shortly (±2 mm.) pedicellate, peduncle more often short and under 5 mm.

[1] Rock (*loc. cit.*) omits all mention of *P. hawaiiense* "var. ? *argenteum*" Hillebr., which, as already remarked above, was undoubtedly equivalent to *P. argentifolium* proper. It may therefore be assumed that Rock overlooked the other characters that are associated with those of the capsules in these two endemic groups of specimens, viz., *P. argentifolium* and its var. *Rockii*.

long. Capsular valves finally obcordate, more or less tomentellous, flat or undulate but not strongly rugose or tuberculate.

Type specimen: Collected by *Charles N. Forbes*, No. 2,064-*M*, Pakiloi, south slope of Haleakala, East Maui, March 23, 1920 (Bish.).

Distribution: East Maui.

Specimens examined: *Forbes* 1,786-*M*, Kanaio, south slope of Haleakala, March 1, 1920 (Berl.; Bish.; Del.; Field); *Forbes* 1,964-*M*, Auwahi, south slope of Haleakala, March 14, 1920 (Berl.; Bish.; Field; Gray); *Forbes* 1,981-*M*, south slope of Haleakala, March 15, 1920 (Bish.); *Forbes* 2,052-*M*, flowers cream-white, very fragrant, Auwahi, March 20, 1920 (Berl.; Bish.; Field); *Forbes* 2,062-*M*, Pakiloi, south slope of Haleakala, March 23, 1920 (Bish.); *Forbes* 2,064-*M* (type, Bish.).

Very similar to the species proper, except in its more or less sessile florets and fruits, these clustered on a commonly very short peduncle. Rarely one or two fruiting pedicels have elongated to about 6 mm.

17. **Pittosporum kauaiense** Hillebr. Fl. Haw. Isls. 25. 1888.

a. Upright trees, ±10 dm. tall, trunk ±2.5 dm. thick; leaf-blades mostly 1–2.4 dm. long and 4–7 (–8.5) cm. wide.

b. Capsules shallowly roughened, their tomentum white (in age somewhat strigose and more or less deciduous).

P. kauaiense sensu stricto.

b. Capsules strongly tuberculate-rugose, their fine tomentum (at times absent in age) brown and estrigose. . var. β *phaeocarpum*.

a. More or less acaulescent, the creeping branches about 2–5 mm. thick; leaf-blades 5–8.5 cm. long and 2.5–4.5 cm. wide.

var. γ *repens*.

Tree ±10 meters tall, branches spreading, the young shoots strigose with white or perhaps more often brown 1-celled hairs. Leaves chartaceous with nerves usually prominent especially on lower surface; blade dark-green, obovate-oblong, shortly acuminate, more or less glabrate above, white- or brown-strigose beneath or in age glabrate, 1–2.4 dm. long and 4–7 (–8.5) cm. wide; petiole slender, 1–3.5 cm. long. Flowers fragrant and clustered, the sterile chiefly terminal, the fertile axillary or cauline. Axis of inflorescence slender, commonly about 6–8 mm. long, densely and more or less appressedly brownish-pubescent, many-flowered; the linear-subulate

bracts ±5 mm. long, brownish-pubescent; pedicels similarly pubescent, slender or subcapillary, up to 7 mm. long. Sepals lanceolate to ovate, acute at apex, pubescent or irregularly glabrate, 1.5–2 mm. long. Corolla cream-colored, small in both sexes, the slender tube 4–7 mm. long, the oblong lobes 2–3 mm. long. Stamens equalling corolla-tube, style a little longer. Capsule subglobose or somewhat cubical, about 1.1–1.5 cm. each way, with 4 deep, lengthwise furrows (two of these containing the sutures along which the valves later part), shallowly roughened, at first tomentose, the white tomentum somewhat strigose and finally more or less deciduous, the stylar beak straight and 3–4 mm. long. Seeds few, with smooth back, 6–8 mm. long.

Type specimen: Collected by *Valdemar Knudsen* in mountains of Waimea, Island of Kauai (Berl.).

Distribution: Western half of Kauai.

Specimens examined: *Abbé Urbain Faurie* 6, alt. 600 meters, Holokele (Olokele), March, 1910 (Arn.; Del.; Par.); *Faurie* 7, alt. 600 meters, Kauhao, February, 1910 (Arn.; Del., 2 sheets); *Charles N. Forbes & Charles Dole* 47, Kalalau Valley, July 17, 1909 (Berl.; Bish.; Field); *Forbes et al.* 77, Kalalau Trail, July 19, 1909 (Bish.); *Amos Arthur Heller* 2,580, alt. about 2,500 feet, on the ridge west of Hanapepe River, July 17, 1895 (Arn.; Berl.; Corn.; Field; Gray; Kew; Minn.; Mo.; N.Y.; Par.; U.S., 2 sheets); *Heller* (similarly) 2,580, on the ridge west of the Hanapepe River, August 22, 1895 (Mo.); *Joseph F. Rock* 2,014, Kopiwai Forest, Halemanu, February 14–26, 1909 (Bish.; Gray, 2 sheets); *Rock* 2,021, Halemanu, February 14–26, 1909 (Arn.).

Hillebrand (*loc. cit.*) described the capsules as "about 6 lines each way with 4 deep longitudinal furrows, tomentose and roughish, but not tuberculate." The specimens by Heller and by Forbes and Dole clearly belong here. Their capsules are young and covered with a dense, close, white tomentum, this appearing strigose here and there. They are not tuberculate. In certain material with mature capsules (*e.g.*, Rock 2,014) the capsules are likewise not tuberculate or wrinkled but are glabrate.

Rock (Indig. Trees Haw. Isls. 171. 1913) referred to this species trees that had been observed by him at Olokele Canyon and at Makaweli (both localities on Kauai). He noted that they differed from the type in having wrinkled capsules but stated that they were "otherwise the same." Rock's specimens, however, are seen to possess a brownish or brown, not or but slightly and irregularly

white, tomentum covering their capsules, which are rougher or even tuberculate. Moreover, their young leaves and branches are much more conspicuously tomentose and with a tomentum not only denser but darker, usually a cinnamon-brown. His Olokele and Makaweli plants are referred to the following variety.

Pittosporum kauaiense var. *β* **phaeocarpum** Sherff, Amer. Journ. Bot. 28: 19. 1941.

Branchlets and youngest leaves conspicuously brown-tomentose, leaves finally (sometimes tardily, even above) more or less glabrate. Capsule ±1.6 cm. long and thick, strongly tuberculate-rugose, densely and shortly brown-tomentulose, finally at times more or less glabrate and dull-black.

Type specimen: Collected by *Joseph F. Rock*, No. 5,872, in woods of Makaweli, southwestern Kauai, September 28, 1909 (Gray).

Distribution: Western and north-central Kauai.

Specimens examined: *Otto Degener* 10,990, in forest, north of Wahiawa, June 20, 1926 (Field); *Charles N. Forbes* 117-*K*, Waioli Valley, August 2, 1909 (Field); *Forbes* 828-*K*, Waimea Drainage Basin, West Side, July 3–August 18, 1917 (Bish., 2 sheets); *Forbes* 988-*K*, same place and date (Bish.; Field); *Joseph F. Rock* 14 (5,827), in woods above Makaweli, September 28, 1909 (Bish.); *Rock* 17 (2,023), Halemanu, February 14–26, 1909 (Field); *Rock* 5,803, Olokele Canyon, September 30, 1909 (Bish.); *Rock* 5,805, in woods back of Makaweli, September, 1909 (Arn.); *Rock* 5,872 (type, Gray: cotypes, Bish.; N.Y.);[1] *Rock* 5,874, in woods above Makaweli, September 28, 1909 (Arn.); *Rock* 6,080. Halemanu Mt., October 14, 1909 (Bish.); *Harold Saint John* 13,809, slender, bushy tree, 20 feet tall, alt. 3,700 feet, in moist forest, Kumuweia Ridge, Waimea, December 28, 1933 (Bish.; Field); *Carl Skottsberg* 1,008, in forest around Kokee, October 28, 1922 (Bish.; Goth.).

Rock (*loc. cit.*) describes *Pittosporum kauaiense* as "one of the tallest species of *Pittosporum*, reaching a height of 30 to 40 feet, with a trunk of about 10 inches in diameter, which is vested in a smooth whitish bark." Since, however, Rock's observations were based primarily upon material segregated here as var. *phaeocarpum*, it would be advisable to re-examine living trees and compare the

[1] Label for Rock 5,872 on type sheet at Gray Herbarium gives "woods of Makaweli," but the label on cotype sheet at Bishop Museum gives "woods above Makaweli," and, on cotype sheet at New York Botanical Garden, merely "Makaweli."

variety with the species proper as to height, diameter of trunk, nature of bark, etc.

An apparent hybrid of var. *phaeocarpum* with *P. acuminatum* was collected by C. N. Forbes (No. 837-*K*) in Waimea Drainage Basin, west side, Isl. Kauai, July 3 to August 18, 1917 (Bish.). The three old leaves preserved are oblong-obovate, glabrous or glabrate on both surfaces, impressed-veiny above and salient-veiny below, and measure 2.5–3 dm. long and 7.5–8 cm. wide. The three fruiting peduncles observed are axillary, slender, brown-tomentulose, 3–3.5 cm. long, and bear or have borne 1–5 pedicels each, these brown-tomentulose and about 5–6 mm. long. The seven mature capsules remaining are quadrate-globose, ±1.3 cm. long excluding the slender stylar beak, rugose and densely brown-tomentulose, have somewhat cordate valves, and are not much different from those of either supposed parent. Another specimen, doubtless similarly derived, is A. S. Hitchcock 15,553, vicinity of Kaholuamanu, October 26, 1916 (U.S.).

For other remarks on var. *phaeocarpum* see under species proper.

Pittosporum kauaiense var. γ **repens** Sherff, Amer. Journ. Bot. 28: 19. 1941.

More or less ecaulescent, branches slender (±2–5 mm. thick), elongate, creeping, at first densely appressed-hispidulous finally glabrate and turning gray-white. Leaves obovate, membranaceous, on upper surface presently glabrous but underneath more or less permanently covered with a scurfy-floccose or -strigose, exceedingly thin coating; blade 5–8.5 cm. long and 2.5–4.5 cm. wide, apically obtuse; petiole slender, under 1.7 cm. long. Flowers immature, sepals lanceolate and pubescent. Ovary (mature capsule unknown) 8–10 mm. long and wide, rough, moderately or in small patches sparsely white-pubescent.

Type specimen: Collected by *Reverend John M. Lydgate*, No. 3, in Olokele Valley, Island of Kauai, January, 1912 (Bish.).

Distribution: Known only from type locality in southwestern Kauai.

Specimens examined: *Lydgate* 3 (type, Bish.).

Rock (Indig. Trees Haw. Isls. 171. 1913) failed to mention this variety; whether because he was unfamiliar with it or because, not being really a tree, it did not come within the scope of his book, I cannot say. However, Hillebrand was evidently aware of it through a specimen collected by Valdemar Knudsen. Hillebrand (Fl. Haw.

Isls. 25. 1888) cited Knudsen 157, which had been labeled, "stemless, with creeping branches." He described these as "slender and straggling, the leaves glabrate." The specimen, according to Hillebrand, "offers an analogon to the varieties β and ϵ of *Metrosideros polymorpha*" listed in his text. If it be borne in mind that Hillebrand (*op. cit.* 126) was very emphatic in regarding his proposed varieties of *Metrosideros polymorpha* as definite and valid entities, it may well be supposed that with more complete material at hand he would have ventured to designate the Knudsen plant as a distinct variety.

Three immature capsules are on the type, placed about 6 dm. back from the tip of one branch. The leaves are brownish-green above and grayish beneath. They appear glabrate as described by Hillebrand, but a careful inspection with the lens reveals the lower surface to be coated with a very thin, silvery-grayish, skin-like or scurfy investiture in which the appressed setulae are here and there with difficulty evident. In a very few small spots this investiture has sloughed away.

18. **Pittosporum napaliense** Sherff, Field Mus. Bot. Ser. 22: 419. 1941.

Tree ±6.5 meters tall, stem ±2 dm. thick. Leaves large and few, alternate or more often subverticillately disposed at or near tips of branches, slenderly petiolate, petiole 2–5.5 cm. long; blade now oblanceolate-oblong now widely obovate-oblong, at apex obtuse or shortly subacuminate, at base cuneate, submembranaceous, above coriaceous often glossy presently glabrous and pallid with veins not conspicuously impressed, below appressed-setose or scurfy-strigose with sharp and silvery-whitish setae but finally more or less glabrate, more often 1.5–2 dm. long and 5–8.5 cm. wide. Inflorescence subumbelliform, now terminal now axillary or cauline, densely tomentose, peduncle commonly 1–3 (more rarely up to 5) cm. long. Flowers numerous (often 20–30), pedicels 3–7 mm. long. Bracts now ovate-lanceolate now lanceolate-linear, 4–8 mm. long. Sepals tomentose, widely ovate, obtuse at apex, 4–5.5 mm. long. Corolla glabrous, tube only about 7–8 mm. long; lobes spreading, ovate, ±5 mm. long. Ovary narrowly ovate, densely tomentose, 3–4 mm. long, subequal to style in length, glabrous near apex. Stamens: sterile about 3–3.5 mm. long, fertile unknown. Capsule only about 1.5 cm. long (excluding the slender style, this about 3.5 mm. long) and wide, moderately obcompressed, at both ends truncate or subcordate, clothed with dense short gray-brown tomentum or finally irregularly

glabrescent and darkening. Seeds glossy-black, irregularly angulate, 5.5–6.5 mm. long.

Type specimen: Collected by *Harold Saint John & F. R. Fosberg*, No. 13,864, tree, 20 feet tall, trunk 8 inches in diameter, leaves firm, clear-green above, silvery-green beneath, common in moist woods, alt. 500 feet, Hanakapiai, Hoolulu Stream, Napali District, Island of Kauai, December 30, 1933 (Bish.).

Distribution: Known only from District of Napali, northwestern Kauai.

Specimens examined: *Otto Degener & Emilio Ordoñez* 12,616, forest tree, 20 feet tall, Hanakoa, Napali Coast, December 24, 1939 (Berl.; Deg.; Field, 3 sheets); *Saint John & Fosberg* 13,864 (type, Bish.: cotypes, Berl.; Field, 2 sheets; Kew).

Easily recognized by its large, thinnish leaves, which are more or less whitish-strigose beneath, its proportionately large calyces or small corollas, and its small capsules. These last are somewhat tuberculate-rugose if and when they shed their tomentum, but do not become deeply grooved; their valves finally with at most a shallow, median, lengthwise furrow.

19. **Pittosporum insigne** Hillebr. Fl. Haw. Isls. 25. 1888; Rock, Indig. Trees Haw. Isls. 169, pl. 62. 1913.

a. Flowers small, corolla-tube 6–7 mm. long, -lobes about 2–2.5 mm. long; native of southwestern East Maui....var. γ *micranthum*.

a. Flowers larger, corolla-tube ±10 mm. long, -lobes ±6 mm. long.

b. Capsules usually only slightly rugose, leaf-blades up to 1.9 dm. long and to 5 or even 7 cm. wide; native of eastern Molokai. var. δ *Hillebrandii*.

b. Capsules commonly very rugose.

c. Peduncles up to 1.5 cm. long.

d. Leaf-blade 5–8 (more rarely up to 12) cm. long and 2–4.5 cm. wide; native of Maui.....*P. insigne* sensu stricto.

d. Leaf-blade commonly 10–17 cm. long and usually 3.5–5 cm. wide; natives of eastern Molokai. var. ε *Fosbergii* and f. 1. *pertinax*.[1]

[1] Var. ζ *pelekunuanum*, a rare form from eastern Molokai having gigantic leaves with blade ±2.9 dm. long and ±9–10 cm. wide but with inflorescence as yet unknown, doubtless should follow at this point in the key.

c. Peduncles often 3–10 cm. long;[1] leaves when young commonly more or less densely brownish- or reddish-tomentose; bracts of pedicels narrowly linear; native of Maui. var. *β Lydgatei.*

A tree or tall shrub, 3–8 meters tall, with stiff, ascending branches. Leaves mostly in distant whorls, thick-chartaceous, glabrous unless at very first, often brownish when dry, often glossy, obovate-oblong, at apex acuminate, contracting below into a short, slender petiole 0.5–2 cm. long, blade 5–8 (more rarely up to 12) cm. long and 2–4.5 cm. wide. Flowers with heavy but sweet fragrance, both terminal in the uppermost leaf-whorl and axillary or all along the branches, clustered 15–25 in dense, corymbose, densely eglandular-tomentose racemes. Peduncle now 2–3 now up to 15 mm. on same branch; pedicels 4–8 mm. long, subtended by oblong, irregularly tomentulose bracts 4–6 mm. long; rhachis surrounded at base with numerous linear or lanceolate, irregularly glabrescent bracts 6–10 mm. long. Sepals ovate, obtuse to acuminate in same flower, densely covered with light yellow tomentum, 2–3 mm. long. Corolla white, its tube 10–12 mm. long, lobes broadly ovate to obovate and 5–8 mm. long. Ovary tomentose. Capsule oblong or square-rotund in outline, 1.7–2.8 cm. long (exclusive of rarely persisting stylar beak) and 1.5–2.3 cm. thick, as a rule deeply wrinkled, finally more or less glabrate, each valve usually with a deep, median, lengthwise groove; capsule when half-grown especially narrow, its stylar beak slender and about 4 mm. long. Seeds small, thin, shiny, black, about 5.5–6.5 mm. long.

Type specimen: Collected by *William Hillebrand,* alt. 4,000–6,000 feet, West Maui (Berl.).

Distribution: Both East and West Maui.

Specimens examined: East Maui.—*Otto Degener* 10,972, in forest, Pipe-Line Trail, Olinda, July 16, 1927 (Field); *Charles N. Forbes* 233-*M,* in woods of Makawao, July, 1910 (Bish.); *Forbes* 2,580-*M,* west bank of Honomanu Gulch, June 23, 1920 (Berl.; Bish.; Field; Gray); *Joseph F. Rock,* Nahiku, Hinai Hill, May, 1911 (Berl.; Bish.; Field; Gray).

West Maui.—*Edwin H. Bryan, Jr.,* 640, small tree, 2.5 meters tall, flowers white and fragrant, fruit brown (green when young), in lower rain-forest, on ridge, alt. 3,500 feet, Haelaau, December 20, 1928 (Field); *Lucy M. Cranwell, Olof H. Selling, & Carl Skottsberg* 2,777, on slope of Puu Kukui, between Haelaau and Nakalalua,

[1] While this is a character of the variety as such, it must be borne in mind for purposes of identification of herbarium specimens that collectors do not always select for preservation specimens bearing one or more of the longer peduncles.

August 1, 1938 (Goth.); *Otto Degener* 10,968, in rain-swept forest, on summit of Mt. Eke, August 28, 1927 (Berl.; Deg.; Field, 2 sheets); *Degener* 10,973, in forest, near Mt. Eke on Waihee side, July 2, 1927 (Field); *G. R. Ewart III*, No. 79, tree 4 feet tall, flowers greenish-ivory and fragrant, in rain-forest, alt. 3,800 feet, Haelaau-Puu Kukui Trail, December 18, 1928 (Field); *Ewart, III*, No. 138, tree, 6 feet tall, flowers white, very fragrant, in rain-forest, alt. 4,600 feet, Haelaau-Puu Kukui Trail, December 18, 1928 (Field); *Ewart, III & George C. Munro* 104, 5 meters tall, flowers ivory-colored and fragrant, alt. 3,900 feet, in rain-forest, Haelaau-Puu Kukui Trail, December 18, 1928 (Field); *Charles N. Forbes* 124-*M*, Hauaula, June, 1910 (Berl.; Bish.; Field; Gray; Kew; Mo.); *Forbes* 405-*M*, Honokahau Drainage Basin, September 25–October 17, 1917 (Berl.; Bish.; Field); *Forbes* 424-*M*, same locality and date (Bish.); *Forbes* 505-*M*, same locality and date (Bish.); *Forbes* 510-*M*, same locality and date (Field); *Forbes* 2,312-*M*, ridge on left-hand side, Olowalu Valley, May 10, 1920 (Bish.); *Forbes* 2,319-*M*, flowers white with a greenish tinge, slight sweet odor, leaves dark-green, Olowalu Valley, May 10, 1920 (Field); *Forbes & C. M. Cooke* 8-*M*, ridges behind Lahaina, May, 1910 (Bish.; Field); *William Hillebrand*, alt. 4,000 feet, West Maui (Gray); *Joseph F. Rock* 10,069, Iao Valley, October, 1910 (Bish.); *Rock* 16,010, Honokahau Mts., September, 1918 (Bish.); *Rock & Hammond* 8,183, alt. above 4,000 feet, in woods back of Kaanapali, edge of Honokowai, August, 1910 (Berl.; Bish.; Field; Gray); *Harold Saint John* 10,182, small tree, 15 feet tall, flowers with heavy, sweet fragrance, on ridge, alt. 3,300 feet, Haelaau, February 5, 1930 (Berl.; Bish.; Field): *Saint John* 10,215, shrubby tree, 15 feet tall, on wooded ridge, alt. 3,700 feet, Haelaau (above Honokowai), February 6, 1930 (Field).

Dried specimens of this species simulate more or less closely those of *P. sulcatum*, of Oahu. In general, however, *P. sulcatum* may be recognized by its frequently more numerous and usually less exclusively verticillate leaves, its almost always larger sepals, and the glandular, multiloculate hairs clothing its inflorescence.

Hillebrand (*loc. cit.*) knew the species proper only from West Maui and the var. *Lydgatei* (his own var. β) only from East Maui. The two each occur in both parts of Maui, however, and distinctions between them are thus not to be settled lightly upon geographic grounds. Rock (*loc. cit.*) appears to have been misled partly by considerations of geography. Several of his specimens from West Maui were labeled in the herbarium by him as the species proper but belong clearly to the var. *Lydgatei*. Moreover, while he did in

fact correctly admit both the species proper and var. *Lydgatei* as being in East Maui, he had mistaken several var. *Lydgatei* specimens in the herbarium for the species proper. This doubtless was due to over-emphasis of the long-peduncle character thought necessary by him for the var. *Lydgatei*. It is true that the species proper has a short peduncle, but in var. *Lydgatei* the peduncle varies greatly in length and frequently several sprays of the same suite of specimens show a range from subsessile to long-pedunculate inflorescences.

Pittosporum insigne var. β **Lydgatei** Sherff, Amer. Journ. Bot. 28: 19. 1941; *Pittosporum insigne* var. β Hillebr. Fl. Haw. Isls. 26. 1888.

Tree, now ±5 meters now 11–12.5 meters tall. Leaves averaging somewhat larger, narrower, and more glossy, but not consistently so, when young commonly more or less densely brownish- or reddish-tomentose; petiole 1–4 cm. long, blade up to 17 cm. long and 5.5 cm. wide (on the principal leaves of many but not all specimens mostly 2–3.5 cm. wide). Often some of the peduncles elongate (even 3–10 cm. long). Bracts of pedicels more narrowly linear; fruiting pedicels up to 1.6 cm. long. Sepals irregularly tomentose, at times entirely glabrate unless at margins, 2.5–5 mm. long.

Type specimen: Collected by *Reverend John M. Lydgate*, Hamakua, East Maui (Berl.).

Distribution: Both East and West Maui.

Specimens examined: East Maui.[1]—*Otto Degener* 10,964, in rain-forest, Pipe-Line Trail, Olinda, June 18, 1927 (Berl.; Deg.; Field); *Degener* 10,965, in forest, same locality, June 20, 1927 (Berl.; Deg.; Field); *Degener* 10,966, in rain-forest, same locality, June 21, 1927 (Field); *Charles N. Forbes*, in woods near Ukulele, above Olinda, July, 1910 (Bish.); *Forbes* 162-*M*, in woods east of Ukulele, above Olinda, July, 1910 (Berl.; Bish.; Field; Kew); *Forbes* 747-*M*, Ukulele, July, 1919 (Bish.); *Forbes* 2,500-*M*, Kailua, north slope of Haleakala, June 13, 1920 (Bish.); *Forbes* 2,672-*M*, mountains above Hana, July 5, 1920 (Berl.; Bish.; Field); *William Hillebrand & Rev. John M. Lydgate*, Hamakua (Bish.; really a cotype); *George C. Munro* 483, below Olinda, April 24, 1918 (Bish.); *Joseph F. Rock*, Nahiku, January 7, 1909 (Field); *Rock*, Hinai Hill, Nahiku, 1910 (Arn.); *Rock*, in wet forest, East Maui, May, 1911 (Arn.); *Rock* "D," East Maui, May, 1911 (Berl.; Bish.; Field); *Rock* 8,509, Waikamoi Gulch, September, 1910 (Berl.; Bish.; Del.; Field; Gray, 2 sheets;

[1] Several of the East Maui specimens are referred here because of their large, glossy leaves.

Kew; Par.); *Rock* (similarly) 8,509, common in the forest of Hamakua, alt. 4,000 feet, September, 1910 (Arn., 2 sheets); *Rock* 8,611, tree, 35 to 40 feet tall, in lower forest, alt. 2,600–3,000 feet, Makawao, October, 1910 (Arn.; Berl.; Bish., 2 sheets; Field; Gray; Kew; N.Y.); *Rock* 10,071, Hinai Crater, Nahiku, May, 1911 (Bish.; Gray);[1] *Rock & Curran* 10,077, in forest above Makawao, May, 1911 (Bish.); *Harold Saint John* 10,320, tree, 25 feet tall, flowers fragrant, corolla cream-colored or its lobes yellowish, in swampy woods, alt. 4,300 feet, Kula Pipe-Line, Olinda, February 12, 1930 (Berl.; Bish.; Field; leaves long and glossy, but only the Field specimen has a well developed peduncle, this 2 cm. long); *Carl Skottsberg* 851, Kula Pipe-Line (along Olinda-Waikamoi Trail), Haleakala, October 18, 1922 (Bish.; Goth.).

West Maui.—*Otto Degener* 10,970, in forest, one-half mile north of Keahikauo, July 2, 1927 (Berl.; Deg.; Field); *Charles N. Forbes* 94-*M*, Iao Valley, June, 1910 (Berl.; Bish.; Field; Kew; a form with many of the leaves rounded or slightly emarginate at apex and up to 6.5 cm. wide, but not varietally separable); *Forbes* 107-*M*, same locality and date (Berl.; Field; Kew; Mo.); *Forbes* 2,250-*M*, on lateral ridge on right-hand side, Olowalu Valley, May 7, 1920 (Bish.; Field; latter specimen having peduncles up to 8.5 cm. long); *Forbes* 2,388-*M*, on lateral ridge at right, Olowalu Valley, May 16, 1920 (Berl.; Bish.; Field; youngest leaves pubescent beneath but soon glabrous; habit of leaves more as in species proper, but one spray has long peduncle, moreover *Forbes* 2,250-*M*, from the same ridge, is typical for this variety); *Alfred Meebold* (*Degener distrib. No.*) 10,803, Puu Kukui, October, 1935 (Deg.); *Rock*, Iao Valley, 1911 (Arn.; Berl.; Bish.; Field; important as being *especially* typical, with its peduncles ±5 cm. long, of the variety and yet coming from West Maui); *Rock* 8,183, Honokawai (Honokowai), August, 1910 (Gray; N.Y.; the Gray specimen a form with several of the lower bracts of the inflorescence foliaceous, narrowly obovate, ±2 cm. long, densely pubescent); *Harold Saint John* 10,222, small tree, flowers whitish and fragrant, on wooded ridge, alt. 3,800 feet, above Honokowai, Haelaau, February 6, 1930 (N.Y.).[2]

[1] Rock (*loc. cit.*) writes of this and the other Nahiku specimens: "On the northern slope of Haleakala, at Nahiku, on the crater Hinai, at an elevation of about 3,000 feet, the writer met with a large number of trees which will also have to be referred to this species [*i.e., P. insigne*]; they differ from the type specimens in the young leaves, which are covered with light brown tomentum, and in some other minor points." In the var. *Lydgatei* (where the Nahiku specimens really belong), however, the tomentum of the young leaves is not very anomalous, nor is it limited to Nahiku or even to East Maui material.

[2] In addition to the above cited specimens is one by *Degener*, No. 10,971, Hawaiian Isls. (Field).

Rock (Indig. Trees Haw. Isls. 169. 1913) referred to this variety as "a small tree, 15 to 18 feet in height." His No. 8,611 (above cited under East Maui), however, had been determined by himself as this variety ("var. β" of Hillebrand) and in the Arnold Arboretum, where fuller data are present for his *Pittosporum* collections, the label says "35 to 40 feet tall."

Pittosporum insigne var. γ **micranthum** Sherff, Field Mus. Bot. Ser. 22: 415. 1941.

Leaves commonly a little smaller, blade under 11 cm. long and under 5 cm. wide, scarcely glossy above. Axis of inflorescence under 2.5 cm. long; bracts linear-subulate, tomentose or irregularly glabrate, 3–4 mm. long; sepals ovate or ovate-oblong, tomentose or outwardly often glabrate, about 2 mm. long; corolla's tube only about 6–7 mm. long, lobes about 2–2.5 mm. long. Capsule less rugose, at first tomentose presently subglabrate, $\pm$2.3 cm. long and $\pm$1.5 cm. wide; seeds black, strongly and conspicuously tuberculate, $\pm$6.5 mm. long and $\pm$5.5 mm. wide.

Type specimen: Collected by *Charles N. Forbes*, No. 1,800-*M*, on south slope of Haleakala, Kanaio, East Maui, March 1, 1920 (Bish.).

Distribution: Known only from type locality in southwestern East Maui.

Specimens examined: *Otto Degener* 10,963, in arid lava region, Ulupalakua, June 23, 1927 (Berl.; Deg.; Field, 2 sheets); *Forbes* 1,800-*M* (type, Bish.: cotypes, Berl.; Field).

Pittosporum insigne var. δ **Hillebrandii** (Lévl.) Sherff, Field Mus. Bot. Ser. 22: 415. 1941; *Pittosporum Hillebrandii* Lévl. *in* Fedde Repert. 10: 121. 1911.

Leaves commonly larger, petiole up to 4 cm. long, blade up to 1.9 dm. long and 5 or even 7 cm. wide. Corolla-lobes of at least staminate flowers under 5 mm. long, the fertile anthers often wholly exserted above corolla-tube. Capsule usually much less rugose, often appearing smoothish to naked eye.

Type specimen: Collected by *Abbé Urbain Faurie*, No. 17, Pukoo, Island of Molokai, May, 1910 (Par.).

Distribution: Eastern Molokai.

Specimens examined: *Otto Degener* 10,977, in open woods, near Brown's Ranch, eastern Molokai, October 14, 1927 (Berl.; Deg.; Field); *Abbé Urbain Faurie* 10, Pukoo, May, 1910 (Arn.; Del.);

Faurie 15, same locality and date (Arn.; Del., 2 sheets); *Faurie* 16, same locality, June, 1910 (Arn.; Del., 2 sheets); *Faurie* 17 (type, Par.: cotype, Bish.); *Charles N. Forbes* 299-*Mo*, Pukoo, July, 1912 (Berl.; Bish.; Field, 2 sheets); *F. R. Fosberg* 13,364, tree 5 meters tall, in rain-forest, alt. 850 meters, on sloping plateau east of Mapulehu Valley, December 23, 1936 (Bish.; Field); *Joseph F. Rock* 7,002, Wailau Pali, April, 1910 (Arn., 2 sheets; Berl.; Bish.; Field); *Rock* 7,007, same locality and date (Bish.).

Some specimens of var. *Hillebrandii* offer an illusory resemblance to *P. glabrum* var. *spathulatum*, but must not be equated with that plant. Var. *Hillebrandii* has usually larger fruits (these more often oblong in outline, not more often broader than long), their faces more rugose and much less tomentose or even glabrate. Its leaf-habit, too, is usually somewhat different.

Pittosporum insigne var. ϵ **Fosbergii** Sherff, Field Mus. Bot. Ser. 22: 413. 1941.

Shrub or small tree, 3–6 meters tall. Similar to var. *Lydgatei* but differs: leaves more often 3.5–5 cm. wide, above commonly more coriaceous and glossy also more rugosely reticulate-veiny, the nascent ones also terminal portion of branch strongly appressed-hispid but finally glabrescent or more rarely (in dry state brown- or white-) pubescent, blade broader and toward apex less attenuate; peduncle under 1.5 cm. long.

Type specimen: Collected by *Saint John, Baker, Coulter, Fosberg, & Yuncker*, No. 12,604, shrub 10 feet tall, flowers below leaves on stem, on steep *pali* [Hawaiian for bluff, cliff, or precipice], in rain-forest, ridge between Hanalilolilo and Pepeopae, Waikolu Valley, Kawela, Island of Molokai, December 25, 1932 (Bish.).

Distribution: Eastern Molokai.

Specimens examined: *Lucy M. Cranwell & Carl Skottsberg* 2,550, in bog, Pepeopae, July 9, 1938 (Goth.); *Otto Degener* 10,958, in mossy rain-forest, near Puu o Wahaula, April 17, 1928 (Berl.; Deg.; Field, 2 sheets); *Degener* 10,960, in rain-forest, west of Pepeopae, April 12, 1928 (Berl.; Deg.; Field); *Charles N. Forbes* 445-*Mo*, Kalapamoa, August, 1912 (Bish.); *Joseph F. Rock* 6,164, on ridge back of Kamoku, March, 1910 (Arn.; Berl.; Bish.; Del.; Field; Kew); *Saint John, Baker, Coulter, Fosberg, & Yuncker* 12,511, tree 12 feet tall, in wet forest, alt. 3,900 feet, Puu O Kaeha, Kawela, December 23, 1932 (Bish.; Field; Yunck.); *Saint John et alii* 12,604 (type, Bish.: cotype, Field); *Saint John, J. Dunn, & Wm. B. Storey* 13,258, tree, 20 feet

tall, on wooded ridge, alt. 2,400 feet, Kukuinui Ridge, Wailau Valley, July 4, 1933 (Field).

This handsome shrub or small tree was named after Dr. F. R. Fosberg, one of the type collectors, out of grateful appreciation of his assistance in my studies in the genus *Pittosporum*. Dr. Fosberg, as a student in the Hawaiian Islands during recent years, collected, either individually or jointly with one or more others, a vast quantity of invaluable material. All of his many *Pittosporum* specimens he placed at my disposal for study and identification.

In *P. insigne* proper, of Maui, some of the flowers are borne terminally, but in var. *Fosbergii* the flowers are apparently always, as indicated on the type label, cauline. In *P. insigne* var. *Hillebrandii*, which, like var. *Fosbergii*, inhabits eastern Molokai, the fruits are more smoothish and the leaves are usually thinner, also less rugose and glossy above. At times, however, some specimens of var. *Hillebrandii* offer an approach in one or two of these three respects.

In most of the material the leaves have shed all or most of their pubescence but in a few collections this has persisted over half or more of the lower surface. These are here referred to the following form:

Pittosporum insigne var. ϵ **Fosbergii** f. 1 **pertinax** Degener & Sherff *ex* Sherff, Field Mus. Bot. Ser. 22: 414. 1941.

Very similar to var. *Fosbergii* proper but with lower leaf-surfaces more or less tardily glabrescent, their very numerous white setae strongly appressed and finally often coalescing here and there into a very thin, somewhat scurfy, highly imperfect integument.

Type specimen: Collected by *Otto Degener*, No. 10,959, in forest, ravine just south of Maunahui, Island of Molokai, April 15, 1928 (Field).

Distribution: Known only from type locality (about 21° 8′ N. Lat. and about 156° 57′ W. Long.), eastern Molokai.

Specimens examined: *Otto Degener* 10,956, in moderately dry locality, ravine northwest of Puu Makaliilii, May 21, 1928 (Field); Degener 10,959 (type, Field).[1]

The specimens cited would seem sufficiently distinct from var. *Fosbergii* proper to warrant segregation as a separate variety if the strikingly peculiar character of pubescence were more constant.

[1] Also many duplicates of these numbers, as yet undistributed by Mr. Degener.

Var. *Fosbergii* proper, however, shows at times small bits of the same kind of scurfy pubescence that is so characteristic here.

Pittosporum insigne var. ζ **pelekunuanum** Sherff, Field Mus. Bot. Ser. 22: 416. 1941.

Branch (a terminal portion less than 5 cm. long seen) also terminal bud densely whitish-tomentulose. Leaves (only two principal ones seen) large, petiole ±2.3 cm. long; blade oblong or obovate-oblong, at apex shortly acuminate, toward base subabruptly narrowed, finally more or less glabrescent (the few remaining setae solitary or clustered, much appressed, more often silvery-glossy), ±2.9 dm. long and ±9–10 cm. wide, above smoothish and not glossy. Capsule (a single mature one seen) oblong in outline, rugose and sulcate, densely brownish- or white-tomentulose, about 2.2 cm. long and about 1.6 cm. wide.

Type specimen: Collected by *Charles N. Forbes*, No. 586-*Mo*, Pelekunu Valley, Molokai, September, 1912 (Bish.).

Distribution: Known only from type locality on northern coast of eastern Molokai.

Specimens examined: *Forbes* 586-*Mo* (type, Bish.).

In eastern Molokai *Pittosporum sulcatum*, through its var. *Remyi*, and *P. insigne*, through its vars. *Fosbergii* and *Hillebrandii*, tend to approach each other somewhat, possibly through hybridizing. Thus, for example, several specimens referred to *P. sulcatum* var. *Remyi* (*e.g.*, Forbes 250-*Mo*) because of leaf characters have capsules more typical of the average ones found in *P. insigne* var. *Fosbergii*. Forbes 586-*Mo* represents, however, a plant that cannot well be accounted for as an intermediate. Its leaves are much too large to suggest either species. The type has two leaves left substantially intact and a portion of a third. They are so large as to suggest leaves of juvenile or second-growth shoots found in some other arborescent genera, but they are borne on an apparently normal, older branch. Then, too, they are accompanied by the single ripe and partly opened capsule (this unattached and filed in accompanying packet). We have also the consideration that Forbes was a careful collector and would doubtless never have obtained atypic leaves without making a note to that effect. It is unfortunate that no flowers were obtained, but on the basis of the evidence at hand the plant seems best considered as a very large-leaved, densely tomentulose-fruited variety of *P. insigne*.

20. **Pittosporum undulatum** Vent. Jard. Cels. pl. 76. 1800; Edwards Bot. Reg. 1: 16, *tab.* 16. 1815.

Shrub or small tree, rarely 5 meters (or in native habitat up to 12 meters) tall; branches slender, twigs glabrous or sometimes pubescent, bark smooth and gray. Leaves alternate, somewhat less crowded toward tips of branches than in most of the native Hawaiian species, glabrous or when very young somewhat pilose; petiole delicate, 1.5–3 cm. long; blade oblong-oblanceolate, acuminate at both ends, often somewhat glossy, undulate at the margins, 8–13 cm. long and 1.5–3.3 cm. wide. Flowers few, whitish, fragrant, on slender, branched, subulate-bracted, pubescent pedicels; inflorescence terminal on youngest branches, at anthesis ±3 cm. long. Sepals lanceolate-subulate, acuminate above, sparsely pubescent, 5–9 mm. long. Petals oblong-lanceolate above, acute or subacute at apex, very slightly connate, ±9 mm. long. Ovary 2-celled, hairy. Capsule obcompressed, yellow when fresh, 1–1.5 cm. long and often slightly wider, erugose, glabrous or near middle obscurely fulvo-tomentulose, about 25-seeded, the persistent style ±2 mm. long. Seeds angular, only about 3 mm. long and 1 mm. thick, dark brown, smooth.

Type specimen: Ventenat had before him a shrub, erroneously understood by him to have come from the Canary Islands. This had been cultivated for some years at the garden of J. M. Cels, passing the winter in the orange-house and blooming "en messidor et thermidor" (June 19 to August 17). According to Edwards (*loc. cit.*), this shrub was introduced into England "by Sir Joseph Banks from New Holland in 1789," and "Monsieur Ventenat was misinformed when he stated it to be a native of the Canary Islands."

Distribution: "Completely naturalized and common along the roadside and open forest between Honokaa and Kamuela, Kohala District of Hawaii" (Degener, Fl. Haw. fam. 156. May 5, 1937). Native of Australia.

Specimens examined: *Otto Degener* 9,089, naturalized and common along road above Honokaa, between Waimea and Honokaa, Kohala District, March 25, 1930 (Corn.; Mo.; N.Y.); *Degener* 9,090, naturalized in open forest near road in region above cane-fields, Honokaa, July 28, 1926 (Corn.; Deg.; Mo.; N.Y.); *Degener* 9,091, Kohala District, March 22, 1930 (N.Y.); *Charles Sheldon Judd* 31, tree 5 meters tall, fruit yellow, alt. 500 meters, planted along Government Road near Honokaa, November 18, 1925 (Bish.).

Degener (*loc. cit.*) states that this species was "introduced, probably with many other interesting plants, by W. Herbert Purvis who began the growing of sugarcane at Kukuihaele about 1875."

21. **Pittosporum confertiflorum** A. Gray, Bot. U. S. Explor. Exped. 232, pl. 19. 1854.

a. Leaf-blade usually 7.5–18 cm. long and 3.5–5 cm. wide; capsules mostly 2–3 cm. long.

b. Axis of inflorescence (including peduncle) 2–7 cm. long, pedicels mostly 1.3–3.3 cm. long; native of West Maui.
var. γ *longipes.*

b. Axis of inflorescence (including peduncle if present) 1–3 cm. long, pedicels 6–12 mm. long.

c. Leaves mostly pale brownish- or whitish-tomentose beneath; sepals broadly ovate; native of Maui and Hawaii.
P. confertiflorum sensu stricto.

c. Leaves mostly rufo-tomentose beneath; sepals lanceolate or moderately ovate; native of Oahu, Lanai, central easternmost West Maui, and Hawaii.....var. β *Mannii.*

a. Leaf-blade usually 3–7.5 cm. long and 1.3–3.5 cm. wide; capsules under 1.5 cm. long; native of Lanai.....var. δ *microphyllum.*

A tree, 6–9 meters tall, branches stout and stiff; branchlets tomentose when young. Leaves many, especially so near ends of branchlets, alternate or at times imperfectly verticillate, coriaceous, obovate or at times obovate-oblong, apically obtuse or often shortly acuminate, basally tapering into a distinct petiole 1–2.5 cm. long, tomentose on both surfaces when nascent but finally very glabrous and at times somewhat glossy above, remaining densely tomentose beneath with brownish or more or less whitening wool (or this at times irregularly or completely deciduous), with moderately to conspicuously salient lateral nerves, finely bullate-reticulated on upper surface, blade usually 7.5–15 cm. long and 3.5–5 cm. wide, the entire margins somewhat revolute. Inflorescence of both sexes terminal or at times also axillary and even cauline, very tomentose except for fragrant corollas, when terminal having numerous flowers, these densely crowded in a corymbose, at times sessile raceme having an axis 1–3 cm. long. Pedicels 6–12 mm. long, these and peduncle at times becoming glabrate in age; bracts linear-oblong, up to ±16 mm. long. Sepals orbicular-ovate, obtuse, imbricated, about 6 mm. long. Corolla glabrous, cream-colored, tube 10–12 mm. long;

petal-tips broadly ovate, 6–8 mm. long, spreading, imbricated or sometimes convolute in aestivation. Stamens nearly equalling tube of corolla, filaments filiform-subulate; anthers linear-sagittate, apiculate. Pistil about 1.2 cm. long; ovary sessile, oblong in outline, tomentose, incompletely 2-celled; style thick, glabrous, about as long as ovary; stigma truncate, undivided. Capsule globose-ovoid, somewhat flattened; valves woody, usually thick, about 2.5 cm. long, ovate to vertically or seldom horizontally oblong in outline, externally more or less persistently tomentose and usually tuberculate-wrinkled and rough but sometimes somewhat smoothish. Seeds compressed and angled, crenulate on dorsal edges.

Type specimen: Collected by the *United States Exploring Expedition under Captain Charles Wilkes*, at base of Crater of Haleakala, East Maui, about 1840 (U.S., 2 sheets).

Distribution: Both East and West Maui; also at Kahuku, Island of Hawaii.

Specimens examined: East Maui.—*Charles N. Forbes* 287-*M*, Crater of Haleakala, August, 1910 (Berl.; Bish.; Field; Kew; Par.); *Forbes* 896-*M*, east of Ukulele, July 20, 1919 (Bish.; Field); *Forbes* 1,013-*M*, Keanae Gap, Crater of Haleakala, August 2, 1919 (Bish.); *Forbes* 1,054-*M*, same locality, August 3, 1919 (Bish.); *Forbes* 1,126-*M*, Crater of Haleakala, above Oili Puu, August 12, 1919 (Bish.); *Forbes* 2,005-*M*, south slope of Haleakala, Lualailua, March 17, 1920 (Field); *Rock* 8,681, near Kaupo, District of Auwahi, November, 1910 (Bish.); *Carl Skottsberg* 835, alt. 2,200–2,300 meters, in Crater of Haleakala, below highest rim, October 16, 1922 (Bish.; Goth., 2 sheets); *United States Southern Pacific Exploring Expedition under Captain Charles Wilkes*, base of Crater of Haleakala, about 1840 (type, U.S., 2 sheets: cotypes, Gray; Kew).

West Maui.—*Otto Degener* 10,969, near Puu Anu on Manawainui Gulch side, July 12, 1927 (Field; fragmentary and lacking a terminal inflorescence); *Carl Skottsberg* 791 *pro parte*, Iao Valley, October 11, 1922 (Goth.).

Hawaii.—*Alfred Meebold* (*Degener distrib. No.*) 10,802, Kahuku, November, 1935 (Field).

Pittosporum confertiflorum var. β **Mannii** Sherff, Amer. Journ. Bot. 28: 24. 1941; *Pittosporum confertiflorum* var. β Hillebr. Fl. Haw. Isls. 26. 1888.[1]

[1] It will be noted that *Pittosporum confertiflorum* var. β H. Mann (Enum. Haw. Pl. No. 17; Proc. Amer. Acad. 7: 150. 1867) is omitted here. It is true

Leaves usually smaller rarely larger, their tomentum usually reddish-brown. Inflorescence of both sexes at first terminal, but the fruiting one often finally axillary by the development of a terminal shoot. Sepals lanceolate or moderately ovate. Capsules often more narrowly ovoid and more extremely roughened (at times suggesting an exceptionally rough peach-pit), in age pubescent or glabrate.

Type specimen: Collected by *Horace Mann & William T. Brigham*, No. 337, Island of Lanai, 1864–1865 (Corn.).

Distribution: Central easternmost West Maui and islands of Oahu, Lanai, and Hawaii.

Specimens examined: Oahu.—*H. F. Bergman*, alt. 3,200 feet, in wet soil, on exposed slope, north side of Mt. Kaala, February 11, 1928 (Field); *Edwin H. Bryan, Jr.*, alt. above 3,000 feet, by trail, east side, Puu Kaala, Waianae Mts., July 22, 1928 (Field); *Bryan*, alt. 1,000 feet, Pupukea, January 23, 1929 (Field; a strange form, placed here because of terminal inflorescence, but has longer leaves up to 2 dm. long including petiole, like those of *P. cladanthum*); *Bryan* 457, alt. about 3,000 feet, east side trail, Mt. (Puu) Kaala, Waialua District, same date (Corn.); *Otto Degener et alii*, Kaala, May 1, 1938 (Deg.; Field); *Degener, Emilio Ordoñez, & Olof H. Selling* 12,243, in forest, alt. 3,500 feet, southeast slope of Kaala, September 25, 1938 (Field); *Degener, Felix C. Salucop, & Valentin (Valentine) Arlantico* 12,075, in forest, southeast slope of Kaala, December 19, 1937 (Berl.; Deg.; Field); *Degener, Salucop, & Arlantico* 12,076, same locality and date (Deg.; Field; sterile sprays, leaves all entirely glabrate, otherwise closely matching Degener *et al.* 12,075 and *Degener, Ordoñez, & Selling* 12,243 from same locality); *F. R. Fosberg* 8,998, bush, 3 meters tall, alt. 800 meters, on open ridge, east ridge, Puu Kaua, Waianae Mts., November 6, 1932 (Bish.; Field); *Edward Y. Hosaka* 1,263, branching tree, 20 feet tall, in wet woods, alt. 3,700 feet, Puu Kaala, Waianae Mts., October 4, 1934 (Field); *Joseph F. Rock*, Punaluu (Arn.); *Harold Saint John* 11,041, on wooded ridge, alt. 2,600 feet, Puu Kanehoa, Waianae Mts., March 22, 1931 (Bish.; Field); *Olof H. Selling* 3,582, entrance to Kaala, east side of Waianae Mts., September 25, 1938 (Goth.); *Carl Skottsberg (with A. Judd)* 364, north slope of Kaala, Waianae, August 30, 1922 (Goth.; labeled by Skottsberg as *Pittosporum*

that Mann cited Mann & Brigham 337 (the type collection of my var. *Mannii*) for his var. β, but he *first* cited *P. Terminalioides* var. β Gray as a synonym and that variety, as implied elsewhere (see under *P. cladanthum* var. *reticulatum*, p. 531), is apparently very different from *P. confertiflorum* and its varieties.

cauliflorum H. Mann, and so treated by him in Meddel. Göteb. Bot. Trädg. 10: 109. 1936; but has terminal inflorescence).

Lanai.—*Charles N. Forbes* 72-*L*, mountains near Koele, June, 1913 (Field); *Forbes* 73-*L*, same locality and date (Bish.); *Forbes* 86-*L*, same locality and date (Berl.; Field; Kew); *Forbes* 106-*L*, same locality and date (Bish.); *Forbes* 125-*L*, same locality and date (Berl.; Field); *Forbes* 136-*L*, same locality and date (Field; Kew); *Forbes* 140-*L*, mountains behind Koele, same date (Berl.; Del.; Field; Gray); *Forbes* 304-*L*, Lanai, September, 1917 (Bish.); *Forbes* 305-*L*, same locality and date (Bish.); *F. R. Fosberg* 12,589, shrub, 4 meters tall, flowers white and fragrant, alt. 800 meters, in wet gulch bottom, Kaiholena Gulch, December 3, 1935 (Bish.; Field); *Fosberg* 12,593, spreading tree, 5 meters tall, flowers white, not very fragrant, alt. 800 meters, at wet bottom of gulch, near head of Kaiholena Gulch, same date (Field, 2 sheets); *Mann & Brigham* 337 (type, Corn.: cotypes, Bish.; Del.; Field, 2 sheets; Gray; Kew; Mo.; N.Y.; U.S.); *George C. Munro*, Lanai (Field); *Munro*, Kaiholena, June 20, 1914 (Bish.); *Munro*, at foot of cliff, Lanaihale, April 8, 1915 (Berl.; Field; Kew); *Munro* 46, outer forest, Kaiholena, August, 1913 (Bish.); *Munro* 131, on ridge at head of Kaiholena, September 28, 1913 (Bish.); *Munro* 139, Kaiholena, September 28, 1913 (Bish.); *Munro* 252, Waiopaa (Waiapaa), March 24, 1915 (Bish.); *Munro* 331, on ridge head of Maunalei, April 6, 1915 (Bish.); *Munro* 332, Kaiholena, January 3, 1915 (Bish.; form with large leaves, their blades up to 2 dm. long and to 7.5 cm. wide); *Munro* 334, Kaiholena, June 20, 1914 (Bish.); *Munro* 376 *pro parte*, same locality, January 3, 1915 (Bish.); *Munro* 433, Waiopaa (Waiapaa), March 26, 1915 (Bish.); *Emilio Ordoñez* (*Otto Degener distrib. No.*) 12,845, Waialala Gulch, July 7, 1940 (Berl.; Deg.; Field); *Ordoñez* (*Degener distrib. No.*) 12, 848, Puu Alii, July 14, 1940 (Berl.; Deg.; Field); *Ordoñez* (*Degener distrib. No.*) 12,849, same locality and date (Berl.; Deg.; Field); *Jules Remy* 573, Lanai, 1851–1855 (Par.); *Joseph F. Rock* 8,066, Lanaihale, July, 1910 (N.Y.); *Rock* (similarly) 8,066, same locality, July 22, 1910 (Berl.; Del.; Field; Gray; Kew; Par.); *Rock* (similarly) 8,066, Haalelepaakai, July 22, 1910 (Gray); *Rock* 8,087, Kaiholena Valley, July 24, 1910 (Field); *Rock* 8,104, Mahana, August 2, 1910 (Arn.; Berl.; Bish.; Field; Gray; Kew); *Rock* (similarly) 8,104, same locality, August, 1910 (N.Y.); *Rock* 8,108, same locality, July 23, 1910 (Field); *Rock* 8,110, same locality, July 28, 1910 (Berl.; Del.; Field; Kew; Par.); *Rock* 8,111, Kaiholena, August 5, 1910 (Berl.; Bish.; Field); *Rock* (similarly) 8,111, tree, 15 feet tall,

leaves greenish underneath, fruits dark-purple inside, first valley, dry foothills of Mahana, same date (Arn.); *Rock & Hammond* 8,066, on top of ridge leading to the main one, July 22, 1910 (Arn., 2 sheets); *Rock & Hammond* 8,110, in shady places under guayava bushes, valley facing main ridge, July 28, 1910 (Arn.); *Rock & Moki* 8,087, small tree or shrub, at the head of Mahana Valley, July 24, 1910 (Arn.); *Rock & Moki* (similarly) 8,087, Kaiholena Valley, July 24, 1910 (Berl.; Field); *Rock & Moki* 8,108, on top of ridge leading to Haalelepaakai, July 23, 1910 (Arn., 2 sheets; form with more rugose capsules); *Rock & Moki* (similarly) 8,108, Haalelepaakai, same date (Berl.; Field; Kew; form with capsules more deeply sulcate and rugose).

West Maui.—*Charles N. Forbes* 138-*M*, Waikapu Valley, June, 1910 (Bish.); *Joseph F. Rock*, Waikapu Valley, May, 1911 (Arn.; Berl.; Bish.; Field; Kew).

Hawaii.—*Charles F. Forbes* 386-*H*, Kau Desert, August 2, 1911 (Berl.; Del.; Field); *Rock* 12,980, Kona Road, South Kona, August, 1917 (Bish.; form approaching in leaf-texture *P. Terminalioides* var. *macropus* Skottsb. of same locality); *Mrs. Francis Sinclair, Jr.*, Kaolaunui, *commun.* January, 1885 (Kew).

Forms with more veiny and more red-tomentose lower leaf-surfaces may offer a resemblance to *P. cauliflorum* var. *reticulatum*, but usually can be recognized by their narrower sepals and their terminal inflorescence. The type or at least first cited material of Hillebrand's unnamed *P. confertiflorum* var. β came from "Hawaii! *Kau* and *Kona*." His second citation was of the Lanai material collected by Mann and Brigham, No. 337. The Hillebrand type in Berlin has been inaccessible to me because of war conditions. I have therefore, in the interests of absolute certainty, selected Mann and Brigham 337 for the type collection, of which no fewer than nine sheets are now before me.

Occasionally the capsules of Lanai material become exceedingly rough, the several dozen glabrescent surface-elevations on each valve resembling darkened, malformed, fungoid, at times coalesced tongues 4–9 mm. long (*e.g.*, Forbes 304-*L*, Bish.). Fosberg 12,593 has such rough capsules that I originally had regarded it tentatively as representing a new or at least separate species. It is connected with var. *Mannii* quite positively, however, by such specimens as Rock & Moki 8,108. The valves may finally appear more or less cordate when flattened out and measure 3 cm. long and wide.

It seems improbable that *P. cladanthum* occurs on Lanai. Therefore several larger-leaved sprays of sterile or cauline-flowering or

-fruiting material from Lanai that, on Oahu, might pass for that variety, are assumed to belong here (Munro 334 and 376 *pro parte;* Rock 8,104 and 8,111). Rock 8,111 is noteworthy in this respect. The Berlin and Bishop Museum specimens of that plant have all the peduncles cauline, but the Field Museum specimen has, in addition to 3 cauline peduncles, one that is about 2.5 cm. long and is *terminal on a tiny lateral branchlet* of about 8 mm. in length, this bearing at its tip a leaf about 9 cm. long.

Pittosporum confertiflorum var. γ **longipes** Sherff, Field Mus. Bot. Ser. 22: 428. 1941.

Leaf-blade 9–17 cm. long and 3.5–6.5 cm. wide, on upper surface finally glabrate excepting for the veins, on lower surface conspicuously veiny and brown- or reddish-brown-tomentose, at apex acuminate. Flowers unknown. Inflorescence terminal or finally subterminal, loosely racemose, ±15-flowered, densely brown-tomentose, its axis 2–7 cm. long (including slender, up to ±3.5 cm. long peduncle), pedicels slender and commonly 1.3–3.3 cm. long. Capsule unknown.

Type specimen: Collected by *Charles N. Forbes,* No. 28-*M,* on ridges behind Lahaina, West Maui, May, 1910 (Bish.).

Distribution: Known only from type locality in western West Maui.

Specimens examined: *Forbes* 28-*M* (type, Bish.: cotype, Field).

The type had been labeled at Bishop Museum as a new species, with the observation that it was probably related to *P. confertiflorum.* The leaf-characters combined with a terminal inflorescence suggest *P. confertiflorum* var. *Mannii,* but the elongate peduncles, inflorescence-axes, and pedicels separate it at once from that variety. The type has a cluster of five peduncles at the tip of a single branch, each peduncle with several or many pedicels. The cotype has one originally terminal inflorescence and, about 1.5 cm. lower, an axillary inflorescence. As happens in so many forms of *Pittosporum,* a subsequently developed terminal or subterminal shoot has left the upper inflorescence on the cotype subterminal. The shoot has some leaves nearly full-grown but still retaining over most of their upper surface the original brownish tomentum. The older leaves lower down, however, have become completely glabrous above except along some of their veins.

It is unfortunate that flowers and fruits are not at hand. Until they can be had, some doubt must exist, of course, as to the wisdom of assigning this form a varietal status next to var. *Mannii* or indeed under *P. confertiflorum* at all.

Pittosporum confertiflorum var. δ **microphyllum** Sherff, Amer. Journ. Bot. 28: 25. 1941.

Leaves smaller, blade only 3–6.5 (rarely –8) cm. long and 1.3–3.5 cm. wide. Inflorescence always terminal, subsessile. Capsules (1–3 for an inflorescence) smaller, moderately roughened, at first densely brown-tomentose, at last irregularly now tomentose now glabrescent, compressed; valves horizontally oblong-orbiculate, about 1.5 cm. tall and almost 2 cm. wide, seeds 5.5–6.5 mm. long.

Type specimen: Collected by *Charles N. Forbes*, No. 14-*L*, Kaiholena, Island of Lanai, June, 1913 (Bish.).

Distribution: Known only from type locality on Island of Lanai.

Specimens examined: *Forbes* 14-*L* (type, Bish.: cotypes, Berl.; Field; Gray).

A single opened flower on the type has oblong-lanceolate sepals, these about 2.5 mm. long; corolla-tube about 5 mm. long and petal-tips about 2.5 mm. long.

22. **Pittosporum halophiloides** Sherff, Amer. Journ. Bot. 28: 18. 1941.

Tree ±5 meters tall, young branchlets appressedly gray- or brown-tomentose. Leaves disposed more or less in whorls at tips of branchlets, when very young golden-yellow finally blackish-brown, narrowly petiolate; petiole appressed-tomentose, ±1 cm. long; blade obovate, at apex obtuse or scarcely subacuminate, at margins more or less revolute, on upper surface coriaceous also finally glabrous and reticulate with small, impressed veins, on lower surface persistently tomentose with red-brown tomentum and with salient, larger veins, commonly 4–8.5 cm. long and 2–4 cm. wide. Inflorescence of female flowers terminal, corymboid-racemiform (peduncle up to 2 cm. long), brown-tomentose, ±12-flowered with moderately fragrant flowers. Pedicels slender, at least 4–8 mm. long. Sepals lanceolate-ovate, acute, very densely brown-tomentose, 4–6.5 mm. long. Corolla's tube about 8–9 mm. long, lobes 4–5 mm. long; stamens a half shorter than tube. Capsule similar to that of *Pittosporum glabrum*, compressed; valves 2, in outline cordate-rounded, outwardly in part glabrate in part tomentellous, longitudinally marked with a median groove otherwise obscurely rugose or transversely somewhat wrinkled, 1.6–2 cm. long (exclusive of residual style, this about 2 mm. long) and scarcely wider. Male inflorescence unknown.

Type specimen: Collected by *Rock & Hammond*, No. 8,109, tree, 16 feet tall, flowers somewhat fragrant, leaves golden-yellow when young, dark-chocolate-brown when old, Mahana Valley, Island of Lanai, July 31, 1910 (Arn.).

Distribution: Known only from Island of Lanai.

Specimens examined: *George C. Munro*, Lanai (Field); *Rock & Hammond* 8,109 (type, Arn.: cotypes, Berl.; Bish.; Field, 2 sheets; Kew).

The type sheet bears two sprays, the lower one having two branchlets. One of these branchlets bears a single terminal capsule,[1] accompanied by a few fruitless pedicels 6 or 8 mm. long. Lower down on the specimen, however, are two clusters of old, fruitless pedicels. These are especially slender and are mostly 1.4–1.6 cm. long. Whether these perchance represent staminate inflorescences I cannot say.

The species was named in allusion to its resemblance to *Pittosporum halophilum*. From that species, which is a small shrub and not a tree (and which is unknown as to its fruit), *P. halophiloides* differs at once in its proportionately narrower leaf-blades and in having a terminal, not cauline inflorescence. *P. halophiloides* bears a strong superficial resemblance to *P. confertiflorum* var. *Mannii*, from which it differs in not having strongly rugose capsules.

23. **Pittosporum Hosmeri** Rock, Bull. Torr. Bot. Club 37: 297, fig. 1. 1910; also Rept. Haw. Board Agr. and For. Div. For. 84, pl. 20. 1911.

a. Leaves glabrous beneath or at most irregularly and sparsely appressed-setose.....var. γ *Saint-Johnii*.

a. Leaves tomentose beneath.

b. Capsules 4–7.5 cm. long and 4–5.5 cm. wide or thick; leaf-blade up to 2.4 dm. long and 3–6 cm. wide, -petiole 2–3 cm. long; pedicellar bracts 2–4 mm. long; a tree 5.5–10 meters tall.....*P. Hosmeri* sensu stricto.

b. Capsules 2.8–5 cm. long and thick; leaf-blade up to 3.5 dm. long and 5–9 cm. wide, -petiole 1.5–5 cm. long; pedicellar bracts up to 11 mm. long; a much smaller tree or almost a shrub. var. β *longifolium*.

A tree, 5.5–10 meters tall, trunk straight and often 3 dm. thick, branches stout, young shoots densely tomentose. Leaves crowded

[1] One cotype sheet at Field Museum bears a cluster of six mature capsules. A sheet at Berlin has four in one cluster.

at ends of branches, subcoriaceous, petiole 2–3 cm. long; blade oblanceolate or oblong-oblanceolate, at apex acute to shortly acuminate, on upper surface soon glabrous and finely reticulate-veiny, densely tomentose beneath with a light to dark brown or reddish-brown wool, 1–2.4 dm. long and 3–6 cm. wide. Inflorescence axillary and cauline, racemose, ±10 flowers clustered subumbellately toward tip of tomentose axis, this 1–3 cm. long and bracteate especially at and near base with tomentose, linear-subulate, 2–4 mm. long bracts. Pedicels pubescent, about 2 mm. long. Sepals tomentose or at base often glabrate, ovate, acute, about 4 mm. long. Corolla cream-colored, tube about 8–10 mm. long; lobes ovate, mostly 4.5–5.5 mm. long, their veins prominent or in dried material obscure. Fertile stamens as long as corolla-tube, anthers oblong. Ovary tomentose, oblong-ovoid, more than half the length of the slightly exserted style. Capsule tomentose when young, finally more or less glabrate and erugose, in outline oblong to subquadrangular and at both ends more or less cordate, 4–7.5 cm. long and 4–5.5 cm. wide, ±4.5 cm. thick, commonly 2- less often 3- or even 4-valved, often somewhat constricted about half-way up; valves usually with a longitudinal median groove; endocarp bright orange-colored; seeds arranged alternately in two rows on each placenta, black, rugose, 6–7 mm. long, occupying only perhaps a tenth of the capsular cell. Fruits exuding when fresh a milky, glutinous sap.

Type specimen: Collected by *Joseph F. Rock*, No. 3,957, alt. 3,000 feet, on lava field of Puuwaawaa, slope of Mt. Hualalai, North Kona, Island of Hawaii, June 17, 1909 (Bish.).

Distribution: Known only from type locality in northwestern Hawaii.

Specimens examined: *Charles N. Forbes* 29-*H*, Puuwaawaa, June 8–14, 1911 (Berl.; Bish.; Field; Kew; Mo.); *Forbes* 271-*H*, Kanehaha (Kanahaha), North Kona, June 28, 1911 (Bish.); *Forbes* 348-*H*, Honomalino, South Kona, July 23, 1911 (Berl.; Bish.; Field); *Alfred Meebold*, alt. 5,000 feet, Hualalai, May, 1932 (Bish.); *Meebold* 20,810, same locality, November, 1935 (Deg.; N.Y.); *Joseph F. Rock*, Puuwaawaa, June, 1909 (Gray); *Rock* 20 (3,958), Puuwaawaa hill and neighborhood, June 15, 1909 (Bish.); *Rock* 3,957 (cotypes, Arn.; Gray, 2 sheets; *nom. vulg.*, Aawa hua kukui); *Rock* 3,964, Puuwaawaa, June 17, 1909 (Arn.); *Rock* 10,074*a*, Puuwaawaa, March, 1912 (Gray); *Rock* 12,962, same locality, August–September, 1917 (Bish.); *Rock* 17,137, same locality, August, 1917 (Bish.).

This species was named in honor of Mr. Ralph S. Hosmer, Superintendent of Forestry, Division of Forestry, Territory of Hawaii. Rock states that the trees "are loaded with fruit during June and July," but adds that the fruiting season, as in the case of "nearly all the other Hawaiian trees, cannot be relied upon." Specimens have been found in fruit in August, September, and November. About the color of the mature capsules he is silent, although he especially notes the color for var. *longifolium* as orange-yellow. He adds: "The fruits of *P. Hosmeri* and variety *longifolium* are a source of food for the native crow *Corvus hawaiiensis* or *Alala*, which pecks open the large woody capsules and feeds upon the oily seeds within. The crow is peculiar to Kona, Hawaii. Nearly 80% of all the capsules of this species examined by the writer were eaten out by these birds, which are still very common."

Pittosporum Hosmeri var. β **longifolium** Rock, Indig. Trees Haw. Isls. 163, pls. 58 and 60. 1913.

A much smaller tree or almost a shrub. Leaves lanceolate-oblong to obovate-oblong, at apex rounded or acuminate, petiole 1.5–5 cm. long, blade 0.8–3.5 dm. long. Peduncle up to 4.5 cm. long. Bracts up to 11 mm. long. Sepals ovate to ovate-lanceolate, 5–6 mm. long. Capsules smaller, orange-yellow when mature, densely tomentulose or in patches glabrate, (if 10 on a common peduncle, forming a cluster of ±1.2 dm. in diameter,) at times globose, 2.8–5 cm. long and thick. Seeds smaller, 4.5–6 mm. long.

Type specimen: Rock cited no particular type but gave the three localities (1) the drier districts in South Kona, (2) Kilauea, and (3) above Huehue at altitude of 5,000 feet. For South Kona he specified one station, namely, Kapua. His No. 10,023 at Gray Herbarium was from Kapua in South Kona and had been labeled by him, "cotype (flowering)." His 10,074 at Gray Herbarium and at the New York Botanical Garden was from Kilauea Volcano and had been labeled by him similarly "cotype." At the latter institution the specimen was with submature fruits. Hence it would seem to follow that his Nos. 10,023 and 10,074 at Bishop Museum, as in numerous other comparable cases, would be the official types.

Distribution: To the west and southwest on the Island of Hawaii.

Specimens examined: *Otto Degener* 10,989, in forest, near 1926 Lava Flow, July 26, 1926 (Field); *Charles N. Forbes* 286-*H*, Kealapuali, North Kona, June 29, 1911 (Berl.; Bish.; Del.; Field; some of the younger capsules coarsely lumpy); *Forbes* 362-*H*, Kapua, Kona,

July 25, 1911 (Field); *Forbes* 368-*H pro parte*, same locality, July 15, 1911 (Berl.; Bish.; Field; Gray; commixed with *P. Terminalioides* collected in Kau Desert, August 2 of same year); *Albert F. Judd*, flowers cream-white, faintly fragrant, cauline, 1 foot or so below leaves (these clustered in 2 or 3 series at and near end of branch), cult. at Kamehameha Girls' School Hawaiian Garden, Honolulu, Isl. Oahu (from seed brought by Judd from Kau Desert, Isl. Hawaii), March 18, 1938 (Bish.); *Joseph F. Rock*, Puu Laalaau, Hualalai, June 10, 1909 (Gray); *Rock* 21 (3,970), between Hinakapauula and Puu Laalaau, Hualalai, same date (Bish.); *Rock* 22 (3,959), Puu Laalaau, Hualalai, June 10, 1909 (Field); *Rock* 3,805, alt. 4,000 feet, in cool, shady forest on slopes of Hualalai, June 10, 1909 (Arn.); *Rock* 3,806, in forest, Puu Laalaau, same date (Bish.); *Rock* 3,969, alt. 4,500 feet, Hualalai, June 10, 1909 (Arn.); *Rock* 10,023, Kapua, South Kona, January 28, 1912 (cotypes as to flowering material, Arn.; Berl.; Field, 2 sheets; Gray; Kew); *Rock* 10,074, Kilauea Volcano, July, 1911 (cotypes as to fruiting material, Gray; N.Y.); *Rock* 13,038, along the South Kona Road, August, 1917 (Bish.); *Rock & Copeland*, Kapua, South Kona, August, 1915 (Bish.); *Saint John, Hashimoto, Hosaka, Lindsay, & Mitchell* 11,312, tree, 20 feet tall, alt. 2,200 feet, Manuka *mauka* ["*mauka*" being the Hawaiian equivalent for "inland" or "toward the mountains"], Hoopuloa Quadrangle, December 24, 1931 (Berl.; Bish.; Field); *iidem* 11,329, tree, 20 feet tall, wooded *kipuka* ["an open and fertile place in a forest or a lava flow," J. W. Coulter, Gazetteer Terr. Haw. 206. 1935], alt. 1,600 feet, same locality, December 26, 1931 (Berl.; Field; Kew); *iidem* 11,353, wooded *kipuka, aa* [*i.e.*, rough, broken] lava, alt. 1,800 feet, same locality and date (Field); *Carl Skottsberg* 620, Kau-Kona Road, between Pahala and Naalehu, September 21, 1922 (Bish.; Goth.).

Rock (*loc. cit.*) states that "the trees from Kilauea are identical with those from Kapua, South Kona, and also with specimens from the upper slopes of Hualalai, from the forests above Huehue at an elevation of 5,000 feet, while the typical *Pittosporum Hosmeri* is peculiar to Puuwaawaa. So far as can be judged from herbarium specimens, it is impossible to distinguish some large-fruited specimens of the var. *longifolium* from some small-fruited specimens of the species proper. Forbes, Saint John, and Skottsberg, all of them collectors with a first-hand field-knowledge of one or both forms, seem from their labels to have ignored or rejected the var. *longifolium*. It is quite possible, however, that Rock's interpretation

of the variety as valid will be supported by future field-observations. For the present, I have been guided by Rock's statement of geographic range in identifying all doubtful specimens.[1]

Pittosporum Hosmeri var. γ **Saint-Johnii** Sherff, Field Mus. Bot. Ser. 22: 413. 1941.

Shrub, ±1.8 meters tall. Submature and mature leaves with petiole 1.5–3.5 cm. long and blade 10–20 cm. long and 4–7 cm. wide, very glabrous on both surfaces or irregularly and sparsely appressed-setose beneath with straightish, slender, sharp, and at least finally white setae. Flowers yellowish-white, very fragrant. Capsule orange-colored when mature, glabrous, 3.6–4.6 cm. long, 3.5–4.6 cm. thick, 3–4 cm. wide. Seeds 8–9 mm. long and 6–6.5 mm. wide.

Type specimen: Collected by *Harold Saint John, J. W. Coulter, E. Y. Hashimoto, & D. D. Mitchell*, No. 11,442, shrub, 6 feet tall, flowers creamy-white and very fragrant, ripe fruit orange-colored, alt. 4,000 feet, Puuwaawaa, Puu Hualalai, Island of Hawaii, December 30, 1931 (Bish.).

Distribution: Known only from type locality in northwestern Hawaii.

Specimens examined: *Saint John et al.* 11,442 (type, Bish.: cotypes, Berl.; Field).

While discovered in the same locality as that for the species proper, var. *Saint-Johnii* is different in its leaves. Incidentally, it is a shrub and perhaps does not become a tree. Its leaves are glabrous beneath or at most sparsely appressed-setose with white, straightish hairs; only when emerging from the bud are they closely rufous-pubescent. In the species proper, also in the var. *longifolium*, the leaves are more or less permanently dense-tomentose beneath with a light to dark brown or reddish-brown wool.

24. **Pittosporum hawaiiense** Hillebr. Fl. Haw. Isls. 26. 1888; *Pittosporum hawaiense* Hillebr. *ex* Drake del Cast. Ill. Fl. Ins. Mar. Pacif. 110. 1890.

Small tree, ±5 meters tall; branches few, nearly straight, ascending, bark grayish-white. Leaves scattered or disposed in remote whorls, slenderly petiolate, petioles 2–6 cm. long; blade thickish, obovate- or oblanceolate-oblong, at apex abruptly and shortly acuminate or more rarely obtuse, 1.5–2.5 (rarely –3.6) dm. long and 4–7.5

[1] It may be added that no positively *large*-fruited specimens, such as characterize indisputably the *species proper*, have been seen from elsewhere than the species proper's type locality of Puuwaawaa.

(rarely –10) cm. wide, more or less tomentose beneath or in age sometimes glabrate, brownish or pale-grayish-green when dry, veins impressed above and salient beneath. Flowers clustered on axillary or cauline or more rarely terminal peduncles (these tomentose and up to 1.5 cm. long). Bracts lanceolate-subulate to ovate-lanceolate, pubescent, 5–8 mm. long. Pedicels tomentose, 2–7 mm. long. Sepals ovate or triangular-ovate, glabrate or tomentose, 3–4 mm. long. Corolla cream-colored; tube 6–9 mm. long and well split except at top; lobes broadly ovate, about 5 mm. long, slightly pubescent in the bud but presently glabrate. Stamens as long as the corolla-tube, anthers oblong-sagittate. Ovary ovoid, tomentose, the similarly tomentose style almost twice as long. Capsule (when fresh) bluish-glaucous or colored, subquadrangular, cordate or cordate-truncate at base, rounded or more often truncate-rounded at top, ±3.2 cm. long, ±3 cm. wide, ±2.7 cm. thick; valves usually with a broad, deep, median, lengthwise furrow unless near top, variously rugose or grooved, the elevations rounded and finally often glabrate at least in irregular areas. Seeds black, smooth or minutely tuberculate, 7–8 mm. long.

Type specimen: Collected by *William Hillebrand,* in forests of Kona, Island of Hawaii (Berl.).

Distribution: Island of Hawaii.

Specimens examined: *Otto Degener* 10,991, in open forest, on slope of Hualalai between Huehue and Puuwaawaa, August 24, 1926 (Field); *Charles N. Forbes* 348*a*-*H*, Honomalino, Kona, July 23, 1911 (Field); *Forbes* 423-*H*, mountains behind Pahala, Kau, August 9–11, 1911 (Berl.; Bish.; Field; Gray; Kew); *Forbes* 1,083-*H*, between the lava flows of 1868 and 1887 in Kahuku, May, 1916 (Field); *William Hillebrand,* Kohala Range (Bish.; sterile spray with large leaves, the largest 14 × 4 inches, as noted by Hillebrand in his text: "A leaf-specimen picked in a gulch of the *Kohala* range has the largest leaves in the genus, 14′× 4′ ''); *Hillebrand* 306, Kohala (Kew); *Hillebrand* (similarly) 306, Kona (Gray; Kew, 2 sheets); *James Macrae,* Mauna Kea, June, 1825 (Kew); *Joseph F. Rock* 10,011, alt. 2,300 feet, in forest above Naalehu, Kau, January 11, 1912 (Arn., 3 sheets; Berl.; Field; N.Y.); *Rock* (similarly) 10,011, Naalehu forests, Kau, January 12, 1912 (Bish.; Gray, 2 sheets); *Rock* 10,011*a*, alt. 6,000 feet, above Kahuku, 1868 Lava Flow, Kau, January 13, 1912 (Gray); *Rock* 17,134, alt. 6,000 feet, above Kahuku, 1868 Lava Flow, Kau, January 13, 1912 (Bish.); *Rock* 17,135, alt. 4,000 feet, in rain-forest, Kohala Mts., June, 1910

(Bish.); *Carl Skottsberg* 3,304, along road below Naalehu, South Kona, September 16, 1938 (Goth.).

The "bluish-glaucous" capsules are especially noted by Rock (Indig. Trees Haw. Isls. 171. 1913). In the dried herbarium material these have turned to a more or less brownish-black. Hillebrand described the flowers as subsessile, relying doubtless upon his subflowering specimens, which indeed do have subsessile flowers. Specimens at full anthesis, however, have pedicels up to 7 mm. long, as described by Rock (*op. cit.* 169).

Hillebrand's specimens have somewhat narrower and thinner leaves with the veins less deeply impressed but seem well enough connected with the other cited material to preclude varietal segregations.

SOME NEW OR OTHERWISE NOTEWORTHY MEXICAN COREOPSIDEAE

(GENERA HETEROSPERMA CAV. AND BIDENS L.)

AND A NOTE ON XYLOSMA HAWAIIENSE SEEM.

EARL EDWARD SHERFF

Heterosperma Coreocarpoides (Sherff) comb. nov.; *Bidens Coreocarpoides* Sherff, Bot. Gaz. 97: 185. 1935.

The type of *Bidens Coreocarpoides* was collected by E. W. Nelson and E. A. Goldman, No. 7,389, at altitude of 15–60 meters, from Cape San Lucas to San José del Cabo, southernmost Baja California, January 4, 1906. The lone, type specimen originally seen (U. S. Nat. Herb.) lacked achenes and had merely ovaries with a body ±1.5 mm. long.

Recently, Miss Alice Eastwood, Curator of the Botanical Department, California Academy of Sciences, very kindly sent me some herbarium specimens collected by Miss Betty J. Hammerly in Baja California. Among these were several (Hammerly 372) from Sierra de la Laguna, referable to this species but with numerous mature achenes and revealing at once a definite affinity with *Heterosperma* Cav., to which genus my formerly published *Bidens Coreocarpoides* must be transferred. Through Miss Hammerly's excellent material it is possible now to assign here a specimen collected years ago by Brandegee in the same locality. Brandegee had referred his material to *Heterosperma Xanti* A. Gray, a coarser and larger herb which can be told instantly by its large flowering heads, these measuring at anthesis up to 3.5 cm., not 1.2–1.7 cm., across.[1]

With the additional specimens now available it has been possible to redraw the description of the species and a revised description (*descriptio emendata*) is presented herewith:

Herba annua, 1.5–2.5 dm. alta, gracilis, subsimplex vel ramosa, ramis gracillimis erectis vel imis arcuato-adscendentibus glabris (juvenibus prope basim interdum hispidulis) omnibus in 1 vel 2

[1] Nelson & Goldman 7,474 (Field), which may be taken to represent true *H. Xanti*, has 8–10 exterior bracts to the involucre, ligulate florets varying from 6 to 10, the ligules proper 1.4–1.6 cm. long, etc.

pedunculos glabros unicapitulatos nudos vel inferne 1-bracteolatos 5–12 cm. longos terminantibus. Folia opposita, petiolata petiolo marginato glabro vel inferne paulum ciliato plerumque 4–8 (raro –16) mm. longo; lamina simplice vel pro foliis principalibus plerumque pinnata vel rarius subbipinnata 1–1.5 (raro usque ad 2.7) cm. longa; segmentis primariis 1 vel 2 jugis, ultimis crassiusculis, apice obtusis, 0.5–1.2 mm. latis, glabris vel marginibus et nervo mediano plus minusve spinuloso-setulosis. Capitula radiata, erecta, ad anthesin 5–7 mm. alta et circ. 1.2–1.7 cm. lata. Involucrum glabratum, primum subhemisphaericum; bracteis exterioribus 6–8, anguste linearibus, apice saepius subacutis, 2–3.5 mm. longis, quam interioribus ovato-oblongis vel latissime lanceolatis moderate brevioribus. Flores ligulati plerumque 6, aurei vel aurantiaci, ligula anguste vel late oblonga vel elliptico-ovata apice bidenticulata circ. 5 mm. longa, tubo circ. 1.5 mm. longo. Achaenia atra, extima oblanceolato-oblonga, circ. 3 mm. longa, dorso convexo laevia vel subsparsim tuberculata, marginibus (saepe incurvatis) ac faciei ventralis nervo mediano pectinatim cartilagineo-cristata lobulis albidis stramineisve, apice nunc calva nunc biaristata aristis gracilibus irregulariter arcuatis retrorsum hamosis ±1 mm. longis; interiora gracillime linearia, corpore glabro plus minusve tetragono usque ad 9 mm. longo, apice 2–4-aristato aristis subrectis gracilibus subpatentibus retrorsum hamosis usque ad circ. 3 mm. longis.

Annual herb, 1.5–2.5 dm. tall, slender, subsimple or branched; branches very slender, erect or lowest ones curved-ascending, glabrous (sometimes hispidulous near base when young), all ending in one or two peduncles, these glabrous, monocephalous, 5–12 cm. long, naked or toward base 1-bracteolate. Leaves opposite, petiolate; petiole margined, glabrous or infernally somewhat ciliate, commonly 4–8 (rarely –16) mm. long; blade simple or for the principal leaves commonly pinnate or more rarely subbipinnate, 1–1.5 (rarely up to 2.7) cm. long; primary segments one or two pairs, ultimate ones thickish, obtuse at apex, 0.5–1.2 mm. wide, glabrous or at margins and on median nerve more or less spinulose-setulose. Heads radiate, erect, at anthesis 5–7 mm. tall and about 1.2–1.7 cm. wide. Involucre glabrate, at first subhemispherical; outer bracts 6–8, narrowly linear, at apex more often subacute, 2–3.5 mm. long; inner bracts ovate-oblong or very widely lanceolate, moderately longer. Ligulate florets commonly 6, golden or orange; ligule narrowly or broadly oblong or elliptic-ovate, at apex bidenticulate, about 5 mm. long; tube about 1.5 mm. long. Achenes black; outermost ones oblanceo-

late-oblong, about 3 mm. long, smooth or subsparsely tuberculate on the convex dorsal surface, on median nerve of ventral face and at margins (which are often incurved) pectinately cartilaginous-crested with tiny whitish or straw-colored lobes, at apex now bald now 2-aristate (aristae slender, irregularly arcuate, retrorsely barbed, ±1 mm. long); inner ones very slenderly linear, up to 9 mm. long as to glabrous and more or less tetragonal body, at apex 2–4-aristate (aristae straightish, slender, somewhat spreading, retrorsely barbed, up to about 3 mm. long).

Specimens examined (additional to Nelson & Goldman 7,389, above cited): *Townsend Stith Brandegee* 317, Sierra de la Laguna, southernmost part of Baja (Lower) California, January 25, 1890 (type, Field); *Miss Betty J. Hammerly* 372, on dry, sandy slope near stream on west edge of the meadow on Sierra de la Laguna, alt. about 5,000 feet, October 13, 1941 (Calif. Acad.; Field, etc.).

It should be noted in passing that Brandegee distributed under the same collection number, 317, a quite different species of *Heterosperma* which he had collected in September of the same year at San José del Cabo. This species was likewise assumed by Brandegee to be *Heterosperma Xanti* A. Gray, but it differs sharply from that species and is here set forth as:

Heterosperma Brandegeei sp. nov.

Herba annua, erecta, gracilis, simplex vel parce ramosa, ±2 dm. alta, caule glabro vel superne sparsim hispidulo. Folia opposita, mediana conferta, principalia 4–8 cm. longa et bipinnatifida vel irregulariter bipinnata; petiolo marginato interdum angustissimo usque ad 2.3 cm. longo, sparsim ciliato aliter glabro; segmentis ultimis usque ad 1.6 mm. latis, apice acutis, margine raro plano saepe spinuloso-ciliatis. Capitula solitaria, gracillime pedunculata pedunculo glabro vel inferne sparsissime hispidulo 5–9 cm. longo caulem aut 2 vel 3 ramos terminante, radiata, erecta, pansa ad anthesin 5–7 mm. alta et circ. 1.2–1.5 cm. lata. Involucrum glabrum bracteis exterioribus circ. 10 moderate vel saepius angustissime linearibus, 2–3.5 mm. longis, apice acutis, quam interioribus ovatis moderate brevioribus. Flores ligulati circ. 6, flavi, ligula ovato-oblonga vel obovata, apice integra vel bidenticulata, ±4.5 mm. longa. Achaenia matura non visa. Ovaria exteriora glabrata, plana, oblanceolato-cuneata, corpore circ. 2 mm. longa, 2-aristata aristis retrorsum hamosis et ±1.5 mm. longis; interiora angustiora, longiora, saltem 3-aristata aristis aliis similibus.

Annual herb, erect, slender, simple or slightly branched, ±2 dm. tall, stem glabrous or supernally sparse-hispidulous. Leaves opposite, median ones crowded together, principal ones 4–8 cm. long and bipinnatifid or irregularly bipinnate; petiole margined, at times very narrow, up to 2.3 cm. long, sparsely ciliate but otherwise glabrous; ultimate segments up to 1.6 mm. wide, at apex acute, the rarely flat margin often spinulose-ciliate. Heads solitary, very slenderly pedunculate (peduncle glabrous or infernally very sparsely hispidulous, 5–9 cm. long, terminating the stem or 2 or 3 branches), radiate, erect, when expanded at anthesis 5–7 mm. tall and about 1.2–1.5 cm. wide. Involucre glabrous; exterior bracts about 10, moderately or more often very narrowly linear, 2–3.5 mm. long, at apex acute; interior ones ovate, moderately longer. Ligulate florets about 6, yellow; ligule ovate-oblong or obovate, at apex entire or bidenticulate, ±4.5 mm. long. Mature achenes not seen. Exterior ovaries glabrate, flat, oblanceolate-cuneate, about 2 mm. long as to body, biaristate, the aristae retrorsely barbed and ±1.5 mm. long; interior ones narrower, longer, at least 3-aristate, aristae similar to the others.

Specimens examined: *Townsend Stith Brandegee* (similarly) 317, San José del Cabo, southernmost part of Baja (Lower) California, September 29, 1890 (type, Field).

From *Heterosperma Xanti* A. Gray, *H. Brandegeei* differs at once in its smaller and more delicate habit, its rather densely crowded, much larger median leaves, and its small flowering heads. Its median leaves, as viewed on the herbarium sheet, give immediately the impression of being elongate or attenuate in their rachis and segments. Between two successive pairs of primary leaf-segments a rachis may be 1.5 cm. or more in length; and some terminal leaf-segments are 3 cm. or more in length. The unique foliage likewise will distinguish *H. Brandegeei* from *H. microglossum.*

Bidens Bigelovii var. **pueblensis** Sherff, Bot. Gaz. 88: 287. 1929; Field Mus. Bot. Ser. 16: 363. 1937.

Plants collected by Brandegee (T. S., in herb. Univ. Calif. and herb. N. Y. Bot. Gard.) at Sierra de la Laguna, Baja (Lower) California, October 4, 1899, had been determined by him as *Bidens bipinnata* L. The material was atypic for that species, but his judgment was nevertheless followed in my subsequent monographic treatment of the genus *Bidens* (Field Mus. Bot. Ser. 16: 368. 1937). Recently additional material has been collected in the same locality:

Miss Betty J. Hammerly 374, alt. about 5,000 feet, on sandy slope in heavy oak shade above stream on side of the meadow on Sierra de la Laguna, October 13, 1941. Both collections seem better referred to *Bidens Bigelovii* var. *pueblensis* Sherff. The geographic range of this variety, formerly described by me as embracing the states of "Michoacan, Mexico (with Federal District), Puebla, Oaxaca, and Chiapas" in southern Mexico, is thus seen to be extended westward into the southernmost part, known as the cape region, of Baja California.

Bidens leptocephala Hammerlyae var. nov.

Usque ad ±4 dm. alta, foliorum segmentis forsitan latioribus. Capitula demum majora. Achaenia circ. 6–10, graciliter elongato-linearia, recta vel pauca superne arcuata; corpore usque ad 2.3 cm. longa, subatra vel apice straminea, pauca (sine dubio extima) subdense sed breviter tuberculato-hispida, alia infra subsparsim breviterque supra conspicue longiusque hispida; 3 (raro 2 vel 4) aristis plerumque 2.5–5.2 mm. longis.

Up to ±4 dm. tall, segments of leaves perhaps wider. Heads finally larger. Achenes about 6–10, slenderly elongate-linear, straight or a few curved above; up to 2.3 cm. long as to body proper, blackish or at apex straw-colored, a few (without doubt the outermost ones) somewhat densely but shortly tuberculate-hispid, the others infernally somewhat sparsely short-hispid, supernally more noticeably and elongately hispid; aristae (commonly 3, rarely 2 or 4) usually 2.5–5.2 mm. long.

Specimens examined: *Miss Betty J. Hammerly* 302, alt. about 2,000 feet, on shaded north slope near river at Las Animas, ranch at river-fork near base of El Picacho Peak in Sierra de la Laguna, Baja (Lower) California, October 12, 1941 (type, herb. Calif. Acad. Sci.).

A plant with the foliar aspect somewhat as in *Bidens bipinnata* L. but with the disc-florets and achenes few as in *B. leptocephala* Sherff. In the latter species, the achenes are normally biaristate with aristae under 3 mm. long, certain outer achenes are apt to be brownish or reddish-brown and with a body 6–8 mm. long, and the inner achenes have bodies 0.9–1.4 cm. long. The present variety differs sharply in having the achenes mostly triaristate with aristae very commonly 3–4.5 mm. long, the achenial bodies all more or less black or blackish and all considerably longer, ranging from ±1.3 cm. for the outer achenes up to 2.3 cm. for the inner ones.

Bidens leptocephala Ulinei var. nov.

Caulis ramique plus minusve patenti-hispiduli, foliis pinnatis vel subbipinnatis. Involucrum extus hispidum. Achaenia interdum longiora, corporibus usque ad 1.8 cm. longis.

Stem and branches more or less spreading-hispidulous, leaves pinnate or subbipinnate. Involucre externally hispid. Achenes at times longer, their bodies up to 1.8 cm. long.

Specimens examined: *C. H. Mueller* 3,480, in shady meadows and open pine forest, Cañon Huahuatan, 10 miles southeast of Madera, Municipio de Temosachic, State of Chihuahua, Mexico, September 24, 1939 (Field); *Cyrus Guernsey Pringle* 1,574, on shaded banks, Sierra Madre, State of Chihuahua, September 17, 1887 (type, Field).

In my revisional treatment of the genus *Bidens* (Field Mus. Bot. Ser. 16: 365. 1937), I included Pringle 1,574 with *Bidens leptocephala* proper, notwithstanding the fact that it differed sharply in the hispid base of the involucre, etc. Examination of numerous additional specimens of *B. leptocephala* which have come into herbaria the past five years shows substantially no intergradations, thus suggesting the segregation of the Pringle plant as a distinct variety. The name is given in honor of Dr. Edwin Burton Uline, who many years ago examined the type plant and correctly asserted, in pencil on the sheet, that it was not *Bidens pilosa* L. as it had been called on the printed label which had been issued at Gray Herbarium. The type is very closely matched in essential characters by the Mueller material. This consists of six (as yet unmounted) entire specimens which were very kindly sent me by Dr. S. F. Blake, Senior Botanist of the United States Bureau of Plant Industry.

Xylosma hawaiiense Seem. Fl. Vit. 7. 1865; *Drypetes Forbesii* Sherff, Field Mus. Bot. Ser. 17: 560. 1939.

At the time of my transferring *Neowawraea Phyllanthoides* Rock to *Drypetes* (Sherff, *op. cit.* 562) a superficially similar, fruiting spray of a tree from Oahu (C. N. Forbes 1,008-*O*) was described. Relying all too much upon the usually very astute-minded C. N. Forbes' determination of the specimen as belonging to the Euphorbiaceae (his label gave *Antidesma platyphyllum* Mann), I assigned the species to *Drypetes*, naming it *D. Forbesii*. Recently I came to suspect that, notwithstanding Forbes' reference of the type plant to a genus of the Euphorbiaceae, it might rather belong in the

Flacourtiaceae, under *Xylosma* Forst.[1] The aid of Dr. Harold St. John, of the University of Hawaii, was enlisted and he very kindly made a re-examination of the type of *Drypetes Forbesii*. Under date of May 2, 1942, he wrote: "The type sheet of *Drypetes Forbesii* Sherff has a single large branch in fruit. The stem, lenticels, phyllotaxy, leaves, and fruit are exactly like those of *Xylosma* . . . . The attached fruits and the two loose ones in the pocket were all whole and showed no sign of sectioning. The fruits all had two sessile stigmas. I sectioned three of them. All three were 1-celled, with 2–5 parietal apparently amphitropous ovules. Each fruit developed from 1–2 good seeds. I compared all parts of your plant with *Xylosma* and found that it agreed with it completely. I have redetermined the specimen as *Xylosma hawaiiense* Seem., following Sleumer's recent revision."

[1] Dr. F. R. Fosberg tells me that the similarity of *Antidesma* and *Xylosma* in the field is often so strong and deceptive as to deceive the best botanists unless an anatomical study of the fruit's interior (in the case of mature pistillate specimens) is made.

INDEX

Collectors' names and page numbers in *italic* type

Beechey, Captain Frederick William, see *Lay & Collie*
Bergman, H. F., alt. 3,100 ft., north side of Kaala, Feb. 11, 1928, *530*
alt. 3,200 ft., north side of Mt. Kaala, Feb. 11, 1928, *555*
Bridwell, J. C., Waiolani Ridge, Aug., 1916, *508*
Oahu, 1917, *497*
Brown, Forest Buffen Harkness, 1,283, *508*
Bryan, Jr., Edwin H., Koolau Range, Dec., 1919, *489*
Aiea, June 5, 1920, *526*
alt. 1,200 ft., lower west ridge, Kaipapau Valley, Jul. 11, 1920, *526*
alt. above 3,000 ft., Puu Kaala, Jul. 22, 1928, *555*
alt. 1,000 ft., Pupukea, Jan. 23, 1929, *555*
Hauula Forest Reserve, Punaiki Trail, May, 1933, *526*
alt. ±1,500 ft., Kawailoa Ridge, Jan. 5, 1937, *489*
no. 457, *555*
no. 640, *544*
no. 790, *489*
Bush, William, & D. LeRoy Topping, no. 3,718, *489*
no. 3,766, *489*
Chang, Impung, in rain-forest, alt. 1,700 ft., south ridge, Kipapa Gulch, May 15, 1932, no. *489*
Christophersen, Erling, no. 1,384, *526*
Christophersen, Erling, & Edward P. Hume, no. 1,419, *504*
Christophersen, Erling, & Gerrit P. Wilder, no. 1,429 *pro parte*, *499*, *501*, *504*
no. 1,492, *495*
Christophersen, Erling, G. P. Wilder, & E. P. Hume, no. 1,511, *530*
no. 1,577, *523*
no. 1,665, *508*
Cranwell, Miss Lucy May, & Carl Skottsberg, no. 2,550, *549*
no. 2,868*b*, *532*
Cranwell, Miss L. M., Olof Hugo Selling, & C. Skottsberg 2,777, *544*
no. 3,727, *532*
Davis, Miss Hattie, alt. 2,325 ft., Waikane–Schofield Trail, Oct. 16, 1932, *504*
Degener, Otto, no. 9,089, *552*
no. 9,090, *552*
no. 9,091, *552*
no. 10,956, *550*
no. 10,957, *509*
no. 10,958, *549*
no. 10,959, *550*
no. 10,960, *549*
no. 10,961, *509*
no. 10,962, *509*
no. 10,963, *548*
no. 10,964, *546*
no. 10,965, *546*
no. 10,966, *546*
no. 10,968, *544*
no. 10,969, *554*
no. 10,970, *547*
no. 10,971, *547*
no. 10,972, *544*
no. 10,973, *544*
no. 10,975, *499*
no. 10,976, *489*
no. 10,977, *548*
no. 10,978, *516*
no. 10,982, *489*
no. 10,984, *508*
no. 10,987, *483*
no. 10,989, *562*
no. 10,990, *540*
no. 10,991, *565*
no. 10,993, *518*
no. 10,994, *483*
no. 10,995, *532*
no. 10,996, *532*
no. 11,005 *pro parte*, *510*
no. 13,001, *489*
no. 13,002, *526*
no. 13,003, *526*
no. 13,004, *508*
no. 13,007, *530*
Degener, Otto, et alii, Kaala, May 1, 1938, *555*
no. 10,798, *500*
Degener, Otto, & Gordon Dowson, no. 12,926, *526*
Degener, O., Yasuma Iwasaki, & Edwin B. Bartram, no. 10,979, *516*
Degener, O., Martin (Tiburcio) Martinez, & Felix C. Salucop, no. 11,125, *534*
Degener, O., & H. Ochiae, no. 10,988, *489*
no. 10,988*a*, *496*
Degener, O., & Emilio Ordoñez, no. 12,053, *504*
no. 12,203, *534*
no. 12,204, *526*
no. 12,375, *508*
no. 12,576, *526*
no. 12,616, *543*
no. 12,617, *485*
no. 12,618, *485*

Degener, O., E. Ordoñez, & John Foster (otherwise known as *John Foster Williams*), no. 12,297, *526*
no. 12,333, *530*
no. 12,338, *534*
no. 12,359, *530*
Degener, O., E. Ordoñez, & Joe Kepaa, no. 12,737, *530*
no. 12,774, *504*
no. 12,779, *513*
no. 12,811, *530*
Degener, O., E. Ordoñez, & Richard Northwood, no. 12,296, *534*
Degener, O., E. Ordoñez, & Olof Hugo Selling, no. 12,243, *555*
Degener, O., Noel Krauss, & Martin Martinez, no. 11,019, *534*, *535*
Degener, O., & Kwan Kee Park, no. 10,983, *499*
no. 10,985, *526*
no. 10,997, *527*
no. 11,000, *527*
no. 11,001, *495*
Degener, O., K. K. Park, et alii, no. 10,810, *504*
Degener, O., K. K. Park, & Manuel Kwon, no. 10,980, *489*
no. 11,002, *527*
no. 11,003, *508*, *512*
Degener, O., K. K. Park, Colin Potter, William Bush, & D. LeRoy Topping, no. 10,806, *527*
no. 10,811, *508*
no. 10,986, *527*
Degener, O., K. K. Park, C. Potter, & Gordon Shigeura, no. 10,809, *527*
no. 10,812, *489*
Degener, O., K. K. Park, G. Shigeura, & Takamoto, no. 10,807, *530*
Degener, O., K. K. Park, & D. LeRoy Topping, no. 10,808, *531*
no. 11,020, *504*
Degener, O., K. K. Park, D. L. Topping, Wm. Bush, & Richard Northwood, no. 10,999, *534*
Degener, O., & Felix Salucop, no. 11,201, *504*
Degener, O., F. Salucop, & Valentin (*Valentine*) *Arlantico*, no. 11,535 *pro parte*, *489*, *504*
no. 11,569, *504*
no. 11,570, *504*
no. 12,074, *508*
no. 12,075, *555*
no. 12,076, *555*
Degener, O., Takamoto, & Martin Martinez, no. 10,799 *pro parte*, *490*, *504*
Degener, O., Takamoto, Tam, & M. Martinez, no. 10,798 *pro parte*, *490*, *499*
Degener, O., D. L. Topping, M. Martinez, & F. Salucop, no. 11,137, *527*
Douglas, David, no. 20, *492*, *516*, *518*
Duker, Miss Katherine, Manoa Cliff Trail, Jul. 13, 1933, *490*
Manoa Cliff Trail, Jul. 31, 1933, *504*
Ewart, G. R., III, half-way on Pupukea-Laie Trail, Nov. 9, 1928, *504*
no. 79, *545*
no. 138, *545*
Ewart, G. R., III, & George C. Munro, no. 104, *545*
Faurie, Abbé Urbain, no. 1, *484*, *485*
no. 2, *504*
no. 3, *486*
no. 4, *490*
no. 5, *490*
no. 6, *539*
no. 7, *539*
no. 8, *535*
no. 9, *512*
no. 10, *548*
no. 11, *506*
no. 12, *486*
no. 13, *485*
no. 14, *483*
no. 15, *549*
no. 16, *549*
no. 17, *548*, *549*
no. 18, *490*, *493*
no. 19, *483*, *484*
no. 38, *490*, *492*, *493*
Forbes, Charles Noyes, mountains above Ukulele, *537*
in woods near Ukulele, July, 1910, *546*
west side of Nuuanu Valley above Pali, Jul. 25, 1908, *490*
ridge, west Kalihi Valley, Aug. 18, 1908, *490*
Waiolani Ridge, Lanihuli Trail, Sept. 17, 1908, *504*
between Punaluu and Kaipapau, Nov. 14–21, 1908, *512*
Koolauloa Mountains between Punaluu and Kaipapau, Nov. 14–21, 1908, *504*
Lanihuli Ridges, Dec. 10, 1908, *508*
Waiolani Ridge, Dec. 10, 1908, *504*
Makaha Valley, Feb. 12–19, 1909, *495*, *504*, *527*, *534*
Kaala Mountains, Feb. 12–19, 1909, 531
ridge between Waialae Nui and Palolo, Apr. 20, 1909, *504*
Palolo Valley ridges, Apr. 20, 1909, *504*
no. 4-*K*, 483
no. 14-*L*, *559*
no. 28-*M*, *558*
no. 29-*H*, *561*
no. 72-*L*, *556*

Lay, George Tradescant, & A. Collie, without locality, *505*
Oahu, *491*
Lydgate, Rev. John M., south side of Haleakala, *536*
Waialua Mountains, Pole Line Trail, *486*
Hamakua, *546*
Kalihiwai, 1915, *486*
no. 3, *541*
Macrae, James, Mauna Kea, June, 1825, *565*
Mann, Horace, Jr., & William T. Brigham, no. 203 *pro parte*, *491*, *494*, *495*, *509*
no. 313, *516*
no. 337, *555*, *556*, *557*
no. 601, *521*
no. 602, *494*, *495*
no. 603, *483*, *484*
MacCaughey, Vaughan, Mt. Waiolani, October, 1914, *505*
Meebold, Alfred, alt. 5,000 ft., Hualalai, May, 1932, *561*
Waiahole ditch trail, June, 1932, *509*, *527*
alt. 3,000 ft., Makaleha Ridge, June, 1932, *527*
(*Otto Degener* distrib.) no. 10,800, *527*
(*O. Degener* distrib.) no. 10,802, *554*
(*O. Degener* distrib.) no. 10,803, *547*
(*O. Degener* distrib.) no. 10,804, *531*
(*O. Degener* distrib.) no. 10,805, *531*
(*O. Degener* distrib.) no. 10,981, *505*
no. 20,810, *561*
Mitchell, Donald D., Puu Hapapa, Oct. 19, 1930, *534*
Morley, Harold, no. 19, *513*
Munro, George C., without locality, *509*
Lanai, *556*, *560*
Kaiholena, June 20, 1914, *556*
foot of cliff, Lanaihale, Apr. 8, 1915, *556*
no. 46, *556*
no. 131, *556*
no. 139, *556*
no. 252, *556*
no. 331, *556*
no. 332, *556*
no. 333, *519*
no. 334, *556*, *558*
no. 376 *pro parte*, *506*, *556*, *558*
no. 433, *556*
no. 483, *546*
Nitta, Kazuto (*Otto Degener* distrib.) no. 10,981, *505*, *507*
Ordoñez, Emilio (*Otto Degener* distrib.) no. 12,845, *556*
(*O. Degener* distrib.) no. 12,848, *556*
(*O. Degener* distrib.) no. 12,849, *556*
Onouye, Richard, alt. 1,800 ft., on Maakua-Papali Ridge, Oct. 15, 1933, *527*
Oswald, Olaf, no. 3, *509*
Remy, Jules, no. 571, *491*
no. 572 *pro parte*, *495*, *506*, *507*, *509*
no. 573, *556*
Rock, Joseph F. C., Hawaiian Islands, *517*
Maui, *518*
Halawa, *509*
Manuka, *517*
Punaluu, *555*
in rain-forest, alt. 3,000 ft., slopes of Konahuanui, *505*
Koolau Mountains, 1908, *512*
without locality, Oct. 3, 1908, *491*
Nahiku, Jan. 7, 1909, *546*
Palolo, May 9, 1909, *509*
Puuwaawaa, June, 1909, *561*
Puu Laalaau, June 10, 1909, *563*
Hinai Hill, 1910, *546*
Haleakala, above Ukulele, September, 1910, *537*
Auwahi, November, 1910, *518*
Iao Valley, 1911, *547*
in wet forest, East Maui, May, 1911, *546*
Waikapu Valley, May, 1911, *557*
Nahiku, May, 1911, *544*
"D," East Maui, May, 1911, *546*
Mt. Waiolani, October, 1914, *505*
Waianae Mountains, Palikea, Dec. 31, 1915, *522*
Kauai, Oct., 1916, *483*
no. 14 (5,827), *540*
no. 17 (2,023), *540*
no. 18 (5,481), *532*
no. 18 (6,072), *532*
no. 18 (6,074), *532*
no. 18 (6,078), *533*
no. 19 (4,812), *491*
no. 20 (3,958), *561*
no. 21 (3,970), *563*
no. 22 (3,959), *563*
no. 23 (781), *512*
no. 25 (1,069), *509*
no. 170 *pro parte*, *512*, *531*
no. 418, *511*, *512*
no. 535, *512*
no. 710 *pro parte*, *491*
no. 990, *491*
no. 1,210, *509*
no. 1,213, *509*
no. 2,014, *539*
no. 2,017, *483*
no. 2,021, *539*
no. 2,030, *485*
no. 2,031, *483*
no. 2,032, *483*
no. 2,033, *483*
no. 3,805, *563*

no. 3,806, *563*
no. 3,957, *561*
no. 3,964, *561*
no. 3,969, *563*
no. 4,836, *491*
no. 4,839, *491*
no. 5,222, *483*
no. 5,223, *483*
no. 5,224, *483*
no. 5,226, *483*
no. 5,227, *483*
no. 5,229, *483*
no. 5,231, *483*
no. 5,803, *540*
no. 5,805, *540*
no. 5,811, *483*
no. 5,814, *484*
no. 5,817, *487*
no. 5,849, *484*
no. 5,850, *484*
no. 5,872, *540*
no. 5,874, *540*
no. 6,071, *533*
no. 6,080, *540*
no. 6,164, *549*
no. 7,002, *549*
no. 7,007, *549*
no. 8,066, *556*
no. 8,087, *556*
no. 8,104, *556*, *558*
no. 8,108, *556*
no. 8,110, *556*
no. 8,111, *556*, *558*
no. 8,183, *547*
no. 8,376, *501*, *502*
no. 8,384, *501*, *502*
no. 8,509, *546*, *547*
no. 8,610, *537*
no. 8,611, *547*, *548*
no. 8,656, *536*
no. 8,669, *518*
no. 8,681, *554*
no. 8,720, *509*
no. 8,721, *491*
no. 8,866, *533*
no. 8,867, *532*, *533*
no. 10,011, *565*
no. 10,011*a*, *565*
no. 10,023, *562*, *563*
no. 10,069, *545*
no. 10,071, *547*
no. 10,073, *510*
no. 10,074, *562*, *563*
no. 10,074*a*, *561*
no. 10,075, *517*
no. 10,076, *517*
no. 12,962, *561*
no. 12,980, *557*
no. 12,988, *517*
no. 13,031, *517*
no. 13,038, *563*
no. 16,010, *545*
no. 17,003, *534*
no. 17,134, *565*
no. 17,135, *565*
no. 17,137, *561*
no. 17,282, *533*
Rock, J. F. C., & Agee, no. 17,027, *531*
Rock, J. F. C., & H. M. Ballou, Palolo Valley, Nov. 30, 1912, *506*
Rock, J. F. C., & Copeland, Kapua, August, 1915, *563*
Rock, J. F. C., & Curran, no. 10,077, *547*
Rock, J. F. C., & C. N. Forbes, no. 783, *506*
Rock, J. F. C., & Hammond, no. 8,066, *557*
no. 8,109, *560*
no. 8,110, *557*
no. 8,183, *545*
Rock, J. F. C., & Holm, Palolo, September, 1917, *506*
Rock, J. F. C., & Moki, no. 8,087, *557*
no. 8,108, *557*
Rock, J. F. C., & Nevin, no. 6,183, *524*
Rock, J. F. C., & Shaw, no. 10,072, *506*
Rock, J. F. C., & Otto H. Swezey, no. 4,813, *527*
no. 12,581, *506*
Rock, J. F. C., O. H. Swezey, J. C. Bridwell, & Timberlake, right-hand branch of Wailupe Valley, Apr. 14, 1918, *495*
Saint John, Harold, no. 10,026, *506*
no. 10,140, *527*
no. 10,152, *520*
no. 10,182, *545*
no. 10,215, *545*
no. 10,222, *547*
no. 10,320, *547*
no. 10,378, *522*
no. 10,584, *512*
no. 11,041, *555*
no. 11,081, *509*
no. 11,196, *506*
no. 11,556, *506*
no. 12,198, *531*
no. 13,038, *506*
no. 13,809, *540*
no. 14,003, *534*
no. 14,068, *509*
Saint John, H., et alii, no. 13,267, *496*
Saint John, H., Baker, John Wesley Coulter, Francis Raymond Fosberg, & Truman George Yuncker, no. 12,511, *549*
no. 12,604, *549*
Saint John, H., J. W. Coulter, Hashimoto, & Donald D. Mitchell, no. 11,442, *564*
Saint John, H., J. Dunn, & William B. Storey, no. 13,258, *549*
no. 13,267, *494*

Saint John, H., & F. R. Fosberg, no. 13,469, *485*
no. 13,864, *543*
Saint John, H., Hashimoto, E. Y. Hosaka, James C. Lindsay, & D. D. Mitchell, no. 11,312, *563*
no. 11,329, *563*
no. 11,341, *518*
no. 11,353, *563*
Saint John, H., E. Y. Hosaka, E. P. Hume, et alii, no. 10,764, *533*
Selling, Olof Hugo, no. 2,602, *506*
no. 2,868, *533*
no. 3,550, *506*
no. 3,582, *555*
no. 3,676, *512*
Sinclair, Mrs. Francis, Jr., Kaolaunui, *557*
Haolanlii, *commun.* January, 1885, *484*
Shaw, Palolo, *506*, *509*
Skottsberg, Carl, no. 177, *506*
no. 272, *531*
no. 619, *517*, *518*
no. 620, *563*
no. 791 *pro parte*, *518*, *554*
no. 835, *554*
no. 851, *547*
no. 895, *506*
no. 979, *533*
no. 1,008, *540*
no. 1,023, *484*
no. 1,072, *506*
no. 1,792, *528*
no. 1,793, *506*
no. 2,109, *491*
no. 3,304, *566*
Skottsberg, C. (with Albert F. Judd), no. 364, *555*
Suehiro, Miss Amy, Laie Ridge, Feb. 14, 1932, *495*
alt. 3,500 ft., Mt. Kaala, Jan. 8, 1933, *506*
South Opaeula Ridge, Sept. 25, 1935, *513*
Swezey, Otto H., Koolau Mountains, *506*
Ewa, January, 1913, *528*
Waiahole, September, 1916, *531*
Topping, David LeRoy, no. 2,824, *509*
no. 2,890, *495*
no. 2,925, *528*
no. 3,096, *491*
Tsuji, Nobue, windy and rainy area at top of ridge, side of Waikane-Schofield Trail, Oct. 16, 1932, *506*
United States (Southern Pacific) Exploring Expedition under Captain Wilkes, Oahu, *491*, *495*
mountains behind Honolulu, about 1840, *509*
on coast southeast of the crater of Lua Pele and Puna, *516*
base of Crater of Haleakala, about 1840, *554*
alt. 7,000 ft., Mauna Loa, about 1840, *516*, *517*
Wilder, Gerrit P., Maui, 1913, *518*, *537*
Yamaguchi, Michio, no. 1,249, *495*
Yoshinaga, E. K., Pupukea, Jan. 12, 1930, *491*, *528*
Yuncker, Truman George, no. 3,018, *528*

UNIVERSITY OF ILLINOIS-URBANA
3 0112 041653723